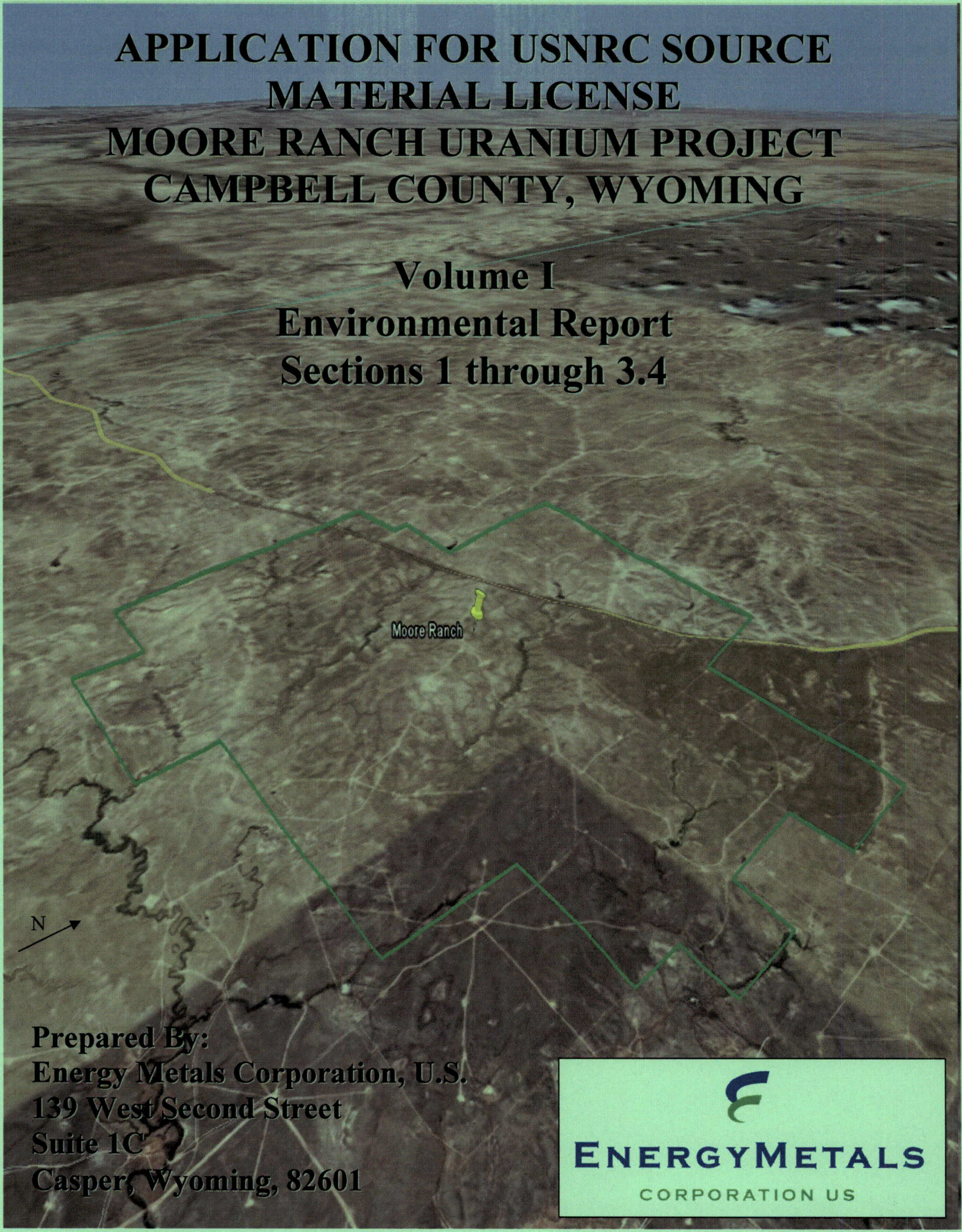
APPLICATION FOR USNRC SOURCE MATERIAL LICENSE
MOORE RANCH URANIUM PROJECT
CAMPBELL COUNTY, WYOMING

Volume I
Environmental Report
Sections 1 through 3.4



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ENERGYMETALS
CORPORATION US

TABLE OF CONTENTS

TABLE OF FIGURES

Section 4

Section 5

Section 6

TABLE OF TABLES

Section 1

Section 2

Section 3

Section 4

Section 5

Section 6

Section 7

Section 8

List of Addendums

Section 3.3

Section 3.4

Section 3.5

Section 6.2

List of Appendices

1 INTRODUCTION OF THE ENVIRONMENTAL REPORT

1.1 PURPOSE AND NEED FOR THE PROPOSED ACTION

Energy Metals Corporation US (EMC) is providing this Environmental Report (ER) in support of an application to the United States Nuclear Regulatory Commission (NRC) for a Radioactive Source Materials License to develop and operate the Moore Ranch Uranium Project, located in Campbell County, Wyoming, by in situ recovery methods. The proposed project will consist of injection/production wellfields, a central plant with ion exchange, resin unloading, elution, precipitation, and yellowcake drying capabilities, and deep injection disposal well(s). EMC controls the uranium resources on the proposed property.

This application and ER has been prepared using suggested guidelines and standard formats from both state and federal agencies. The ER is presented primarily in the NRC format found in Regulatory Guide 3.46. NUREG-1748 was used to ensure that all information is provided to allow NRC Staff to complete their review of this license application.

In 2006, total domestic U.S. uranium production was approximately 4.7 million pounds U_3O_8, or 7 percent of domestic U.S. uranium consumption of approximately 67 million pounds U_3O_8. The Moore Ranch project represents an important new source of domestic uranium supplies that are essential to provide a continuing source of fuel to power generation facilities.

1.2 THE PROPOSED ACTION

1.2.1 Background

The original development of what is now the Moore Ranch Project was conducted by a joint venture between Conoco, Kerr McGee Uranium, and Wold Uranium with Conoco controlling approximately 50% of the joint venture. The project was referred to as the Moore Ranch Mine and Sand Rock Mill Project and much of the exploration and license related work was conducted from the mid-1970s through the early-1980s. Conoco reported discovery and delineation of several mineralized areas in the vicinity.

Conoco delineated 3 planned open pit areas with drilling on 50-foot centers and completed approximately 130 core holes on the property. Applications were developed for both a WDEQ-LQD mine permit and a USNRC Source Materials License (Docket

No. 40-8743), including all required baseline information. A draft Environmental Statement (for the Sand Rock Mill Project) was completed by the NRC in March 1982. However, declining market conditions forced development and licensing activities of the project to cease. Figure 1.2-1 shows the Moore Ranch Project Surface Ownership. Figure 1.2-2 depicts the site mineral ownership.

1.2.2 Site Location and Description

The location of the proposed Moore Ranch Uranium Project is in Township 42 North, Range 75 West, Sections 26, 27, 33, 34, 35, 36 and Township 41 North, Range 75 West, Sections 1, 2, 3, and 4, and Township 42 North, Range 74 West, Section 31. Figure 1.2-3 shows the general location of the site in the Powder River Basin area in relation to surrounding population centers, interstates and highways, and County boundaries.

Access to the site from the east is on State Highway 59 or State Highway 50 to State Highway 387. Access from the west is from I-25 to State Highway 259 to State Highway 387. The main access road to the plant facilities and wellfields is located off Highway 387 in T42N, R75W, Section 27. The access road runs south through Section 34 and forks to the east through Section 35 and also continues south through the permit boundary. This existing access road will provide the primary access to all currently planned wellfields and facilities. Secondary roads for wellfield headerhouse and facility access will fork off of the existing primary access road.

The maps used in this section and other sections of this application were derived from USGS 7.5 minute topographical quadrangle maps from Topo Depot® software and geo spatial data from the Wyoming Geographic Information Science Center. These are CAD/GIS drawings where each road, stream, and contour line are individual entities. This base map was then used for each of the figures prepared for this document with the addition of the pertinent information for that figure.

Figure 1.2-4 shows the general topography, project site layout, and Restricted Areas for the proposed License Area including a central plant, warehouse and maintenance buildings, and office building areas, the potential mine unit boundaries. Other site right of ways such as electrical transmission lines, water pipelines, and oil and gas pipelines are also shown on Figure 4.14-1. Drainage, surface water features, and waterways are shown on Figure 3.4.2-1 in Section 3.4.

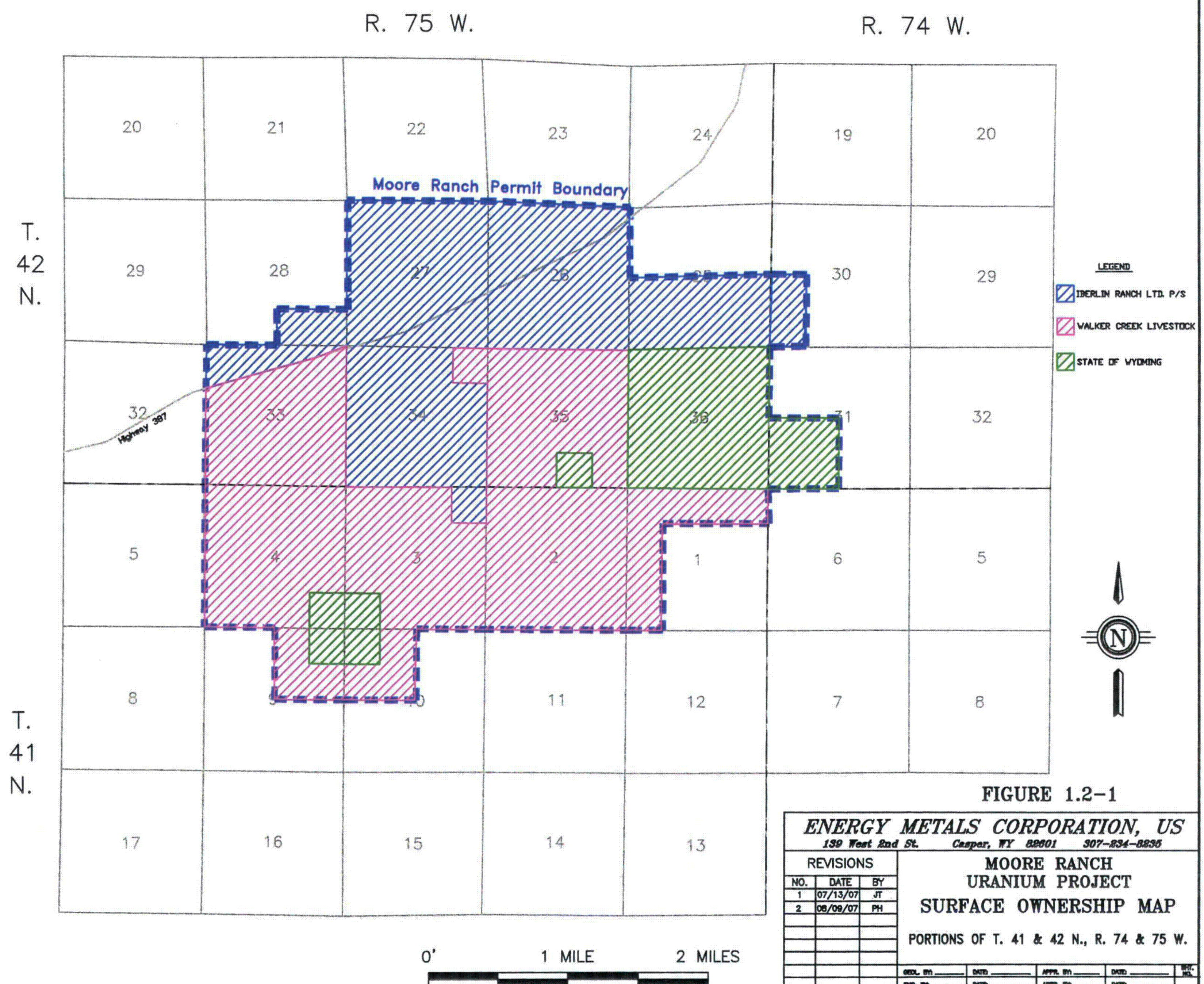

FIGURE 1.2-1

ENERGY METALS CORPORATION, US

139 West 2nd St. Casper, WY 82601 307-234-8235

MOORE RANCH
URANIUM PROJECT
SURFACE OWNERSHIP MAP

PORTIONS OF T. 41 & 42 N., R. 74 & 75 W.

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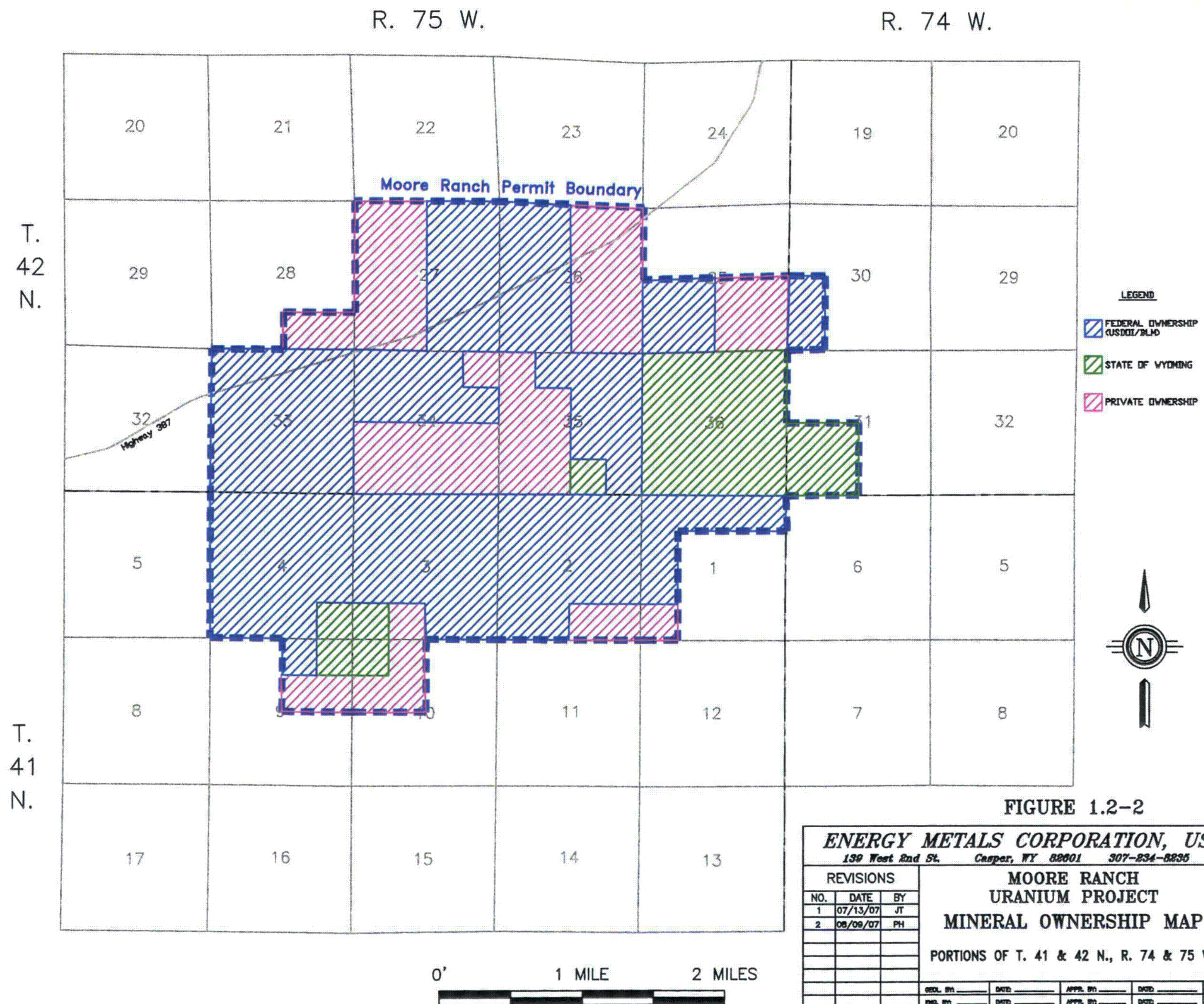

FIGURE 1.2-2

ENERGY METALS CORPORATION, US
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MOORE RANCH
URANIUM PROJECT
MINERAL OWNERSHIP MAP

PORTIONS OF T. 41 & 42 N., R. 74 & 75 W.

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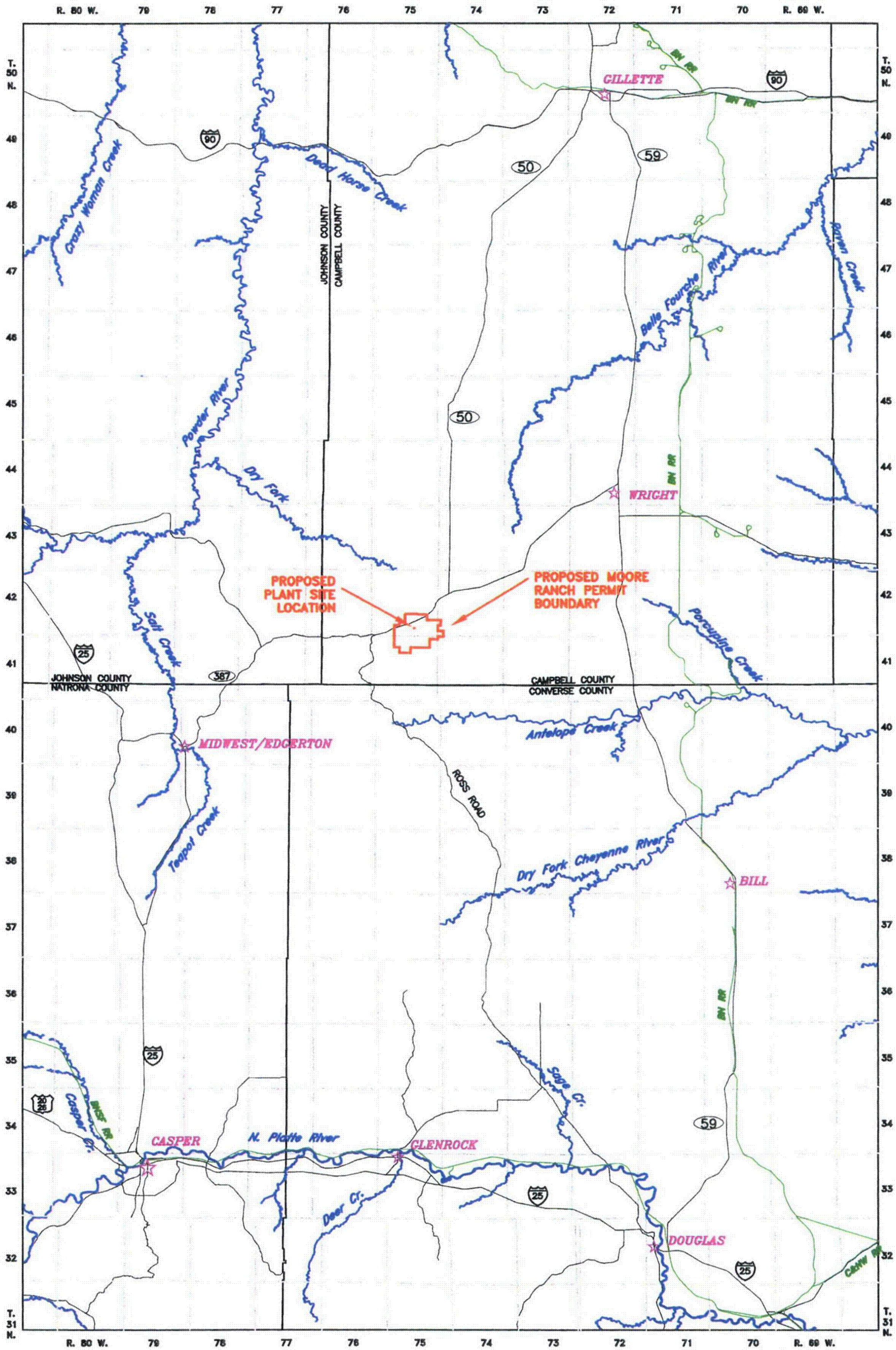
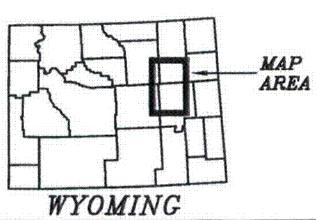
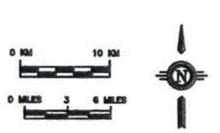


FIGURE 1.2-3





ENERGY METALS CORPORATION, US

130 West 2nd St. Casper, WY 82601 307-234-8235

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MOORE RANCH
URANIUM PROJECT
SITE LOCATION MAP

PORTIONS OF CONVERSE, NATRONA, JOHNSON & CAMPBELL COUNTIES

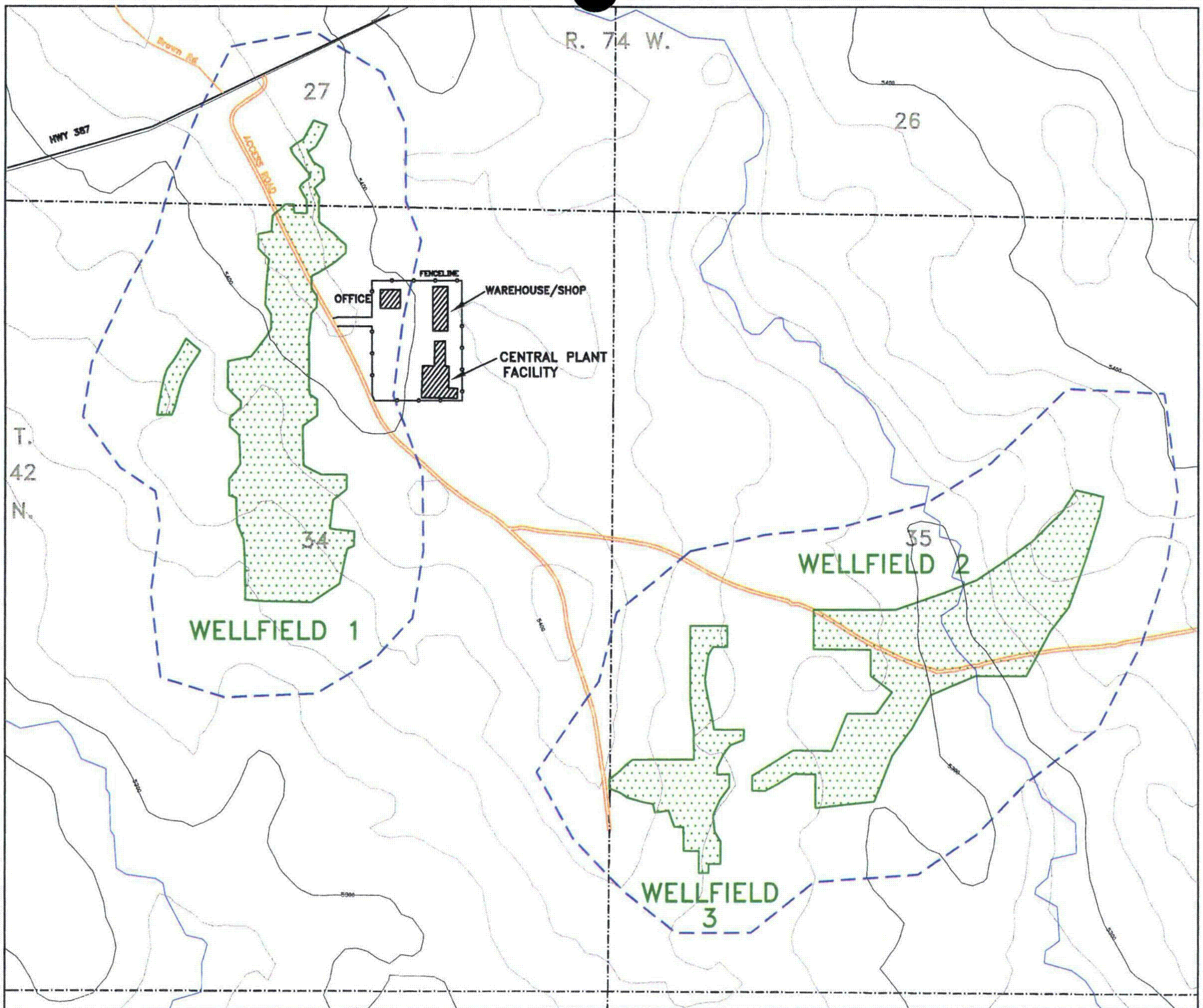


FIGURE 1.2-4

LEGEND

Potential Monitor Well Ring

Potential Wellfield Areas

0' 500' 1,000'

CONTOUR INTERVAL=20'

ENERGY METALS CORPORATION, US

REVISIONS

MOORE RANCH
URANIUM PROJECT
PROJECT SITE LAYOUT

SECT. 34-35, T. 42 N., R. 75 W.

1.3 OPERATING PLANS & SCHEDULES

The Moore Ranch Project will be developed by constructing independent wellfields and mining support facilities. A central plant will be constructed to provide chemical makeup of recovery solutions, recovery of uranium by ion exchange, resin loading/unloading, elution and precipitation circuits, yellowcake drying capabilities, and groundwater restoration capabilities.

The proposed License Area for the Moore Ranch Project contains approximately 7,110 acres. The total surface area to be affected by the proposed operation is within the permit area and will total less than 150 acres. The wellfields, central plant/offices/shop facilities, and two deep disposal wells are the significant surface features associated with the uranium in situ recovery mining operations. There are no evaporation or holding ponds planned for the Moore Ranch Project at this time.

The proposed total wellfield area to be used for the injection and recovery of solution over the ten-year mine life will be approximately 150 acres. The areas will be fenced to limit access by livestock to wellfield areas and will be slightly greater than that encompassed by the areas to be mined.

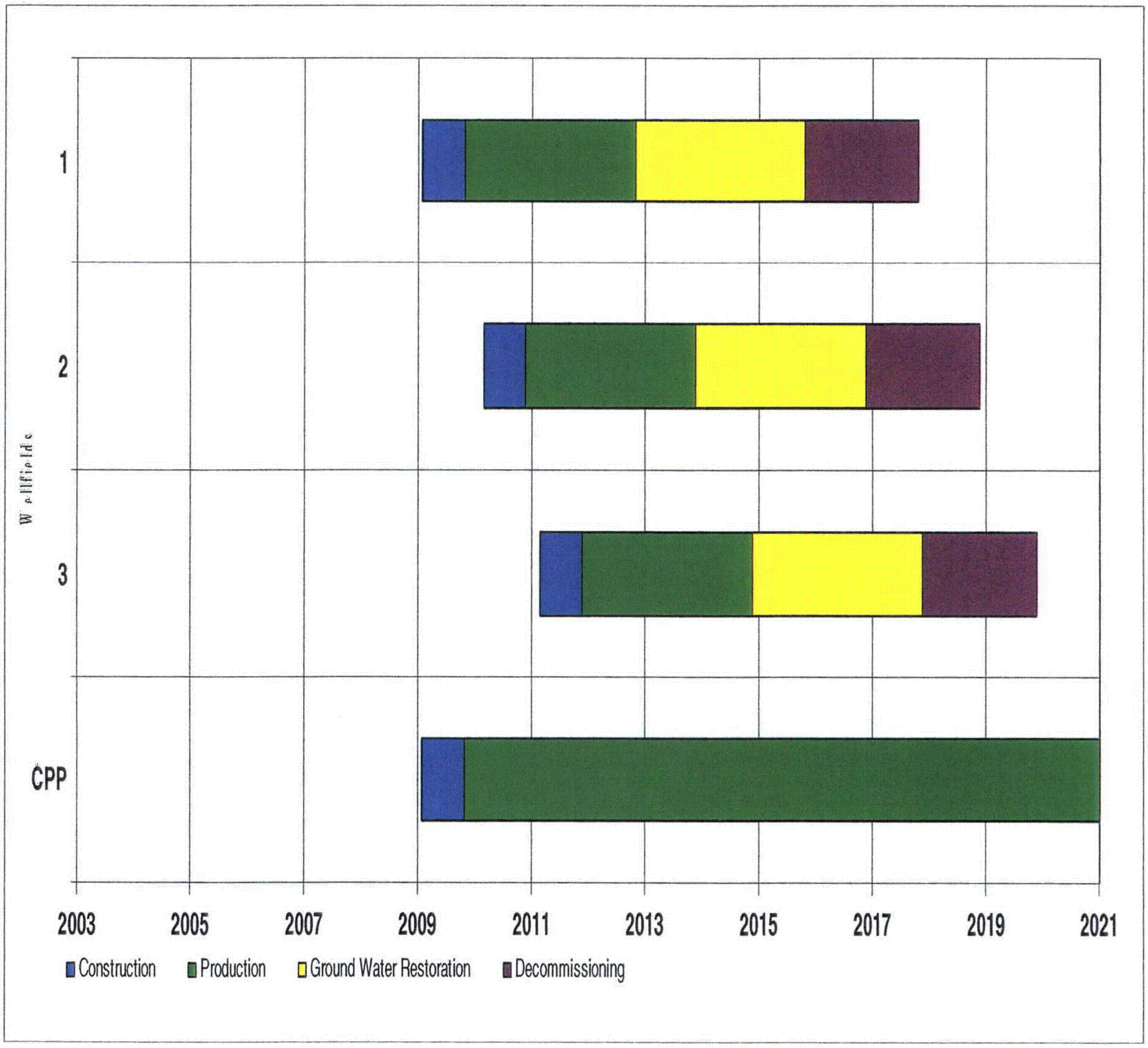
The central plant will operate at a flow rate of 3,000 gpm with an expected annual production rate of up to 4 million pounds per year pounds U_3O_8. Total mineable reserves for the Moore Ranch Project are not fully developed at this time.

The uranium extracted from the wellfields will be loaded onto ion exchange resin in the central plant, which will then be transferred to other areas of the plant for elution, and ultimately precipitation, drying and packaging of uranium. Barren resin will be returned back to the appropriate portion of the ion exchange circuit

1.3.1 Operating Schedule

Following approval of the NRC Source Material License, construction of Wellfield 1, the central plant, and ancillary facilities is planned to begin in February of 2009. Completion of the central plant and ancillary facilities, deep disposal wells, and all or a portion of Wellfield 1 is expected to be completed in November 2009 and startup of operations will commence. Construction of Wellfields 2 and 3 will follow within the next two years respectively. Projected production and restoration schedules for the proposed Moore Ranch Project are shown in Figure 1.3-1.

Figure 1.3-1 Moore Ranch Project Production, Restoration and Decommissioning Schedule



Additional wellfield plans are developed approximately one year prior to the planned commencement of new mining operations. The layout of the planned wellfields is shown in Figure 1.2-4. It is currently anticipated that ISR operations and wellfield restoration will continue for approximately 10 years. At this point, decommissioning of wellfields including well abandonment, piping and equipment removal, wellfield building removal, and surface scanning and reclamation will commence. It is anticipated that the central plant will continue operations past 10 years and after decommissioning of Moore Ranch wellfields in order to accommodate processing of other potential satellite projects in the Powder River Basin.

1.4 APPLICABLE REGULATORY REQUIREMENTS, PERMITS, AND REQUIRED CONSULTATIONS

Table 1.2-1 lists the necessary environmental approvals from Federal and State Agencies required for the Moore Ranch Project. The NRC Licensing process for a source materials license represents the longest lead-time approval; therefore, the majority of the remaining approvals are in-progress or will be initiated with in the next year. All necessary approvals must be secured prior to commencement of commercial production at the site.

Table 1.4-1: Environmental Approvals for the Moore Ranch Uranium Project

Issuing Agency	Description	Status
Wyoming Department of Environmental Quality 122 West 25th St Herschler Building Cheyenne, Wyoming 82001	Underground Injection Control Class III Permit (WDEQ Title 35-11)	Class III UIC Permit application under preparation; expected submittal to WDEQ in November 2007
Wyoming Department of Environmental Quality 122 West 25th St Herschler Building Cheyenne, Wyoming 82001	Aquifer Exemption (WDEQ Title 35-11)	Aquifer exemption application under preparation; expected submittal to WDEQ in first quarter 2008.
Wyoming Department of Environmental Quality 122 West 25th St Herschler Building Cheyenne, Wyoming 82001	Underground Injection Control Class I (WDEQ Title 35-11)	Class I UIC Permit application under preparation; expected submittal to WDEQ in first quarter 2008
Wyoming Department of Environmental Quality 122 West 25th St Herschler Building Cheyenne, Wyoming 82001	Industrial Stormwater NPDES Permit (WDEQ Title 35-11)	An Industrial Stormwater NPDES will be required for the Central Plant Area. Expected submittal second quarter 2008
Wyoming Department of Environmental Quality 122 West 25th St Herschler Building Cheyenne, Wyoming 82001	Construction Stormwater NPDES Permit (WDEQ Title 35-11)	Construction Stormwater NPDES authorizations are applied for and issued annually under a general permit based on projected construction activities. The Notice of Intent will be filed at least 30 days before construction activities begin in accordance with WDEQ requirements.
Wyoming Department of Environmental Quality 122 West 25th St Herschler Building Cheyenne, Wyoming 82001	Mineral Exploration Permit (WDEQ Title 35-11)	Mineral Exploration Permit 342DN Approved: August 22, 2006
Wyoming Department of Environmental Quality 122 West 25th St Herschler Building Cheyenne, Wyoming 82001	Underground Injection Control Class V (WDEQ Title 35-11)	The Class V UIC permit will be applied for following installation of an approved site septic system during facility construction
U.S. Nuclear Regulatory Commission Washington, DC 20555	Source Materials License (10 CFR 40)	Application Submitted herein
U.S. Environmental Protection Agency 1200 Pennsylvania Ave, NW, Washington, DC 20460	Aquifer Exemption (40 CFR 144, 146)	Aquifer exemption application forwarded to EPA following WDEQ action

1.4.1 Environmental Consultation

During the course of the preparation of this license application, consultations were conducted with several agencies:

Ecological Resources

Preparation of the ecological resources discussion (Sections 3.5 and 4.5) required consultations with the following individuals and agencies:

- Wetlands — Mike Burgan US Army Corps of Engineers
  2232 Del Range Blvd. Suite 210
  Cheyenne, WY 82009

- Soils — Jon Sweet – Soils Scientist – WDEQ-LQD, District III
  1866 South Sheridan Ave.
  Sheridan, WY 82801

- Vegetation — Stacy Page – WDEQ-LQD, District III
  1866 South Sheridan Ave.
  Sheridan, WY 82801

- Wildlife — Vern Stetler - Coordinator
  Statewide Habitat Protection
  Wyoming Game and Fish Department
  5400 Bishop Rd.
  Cheyenne, WY 82006

  Scott Covington - Terrestrial Biologist
  Wyoming Game and Fish Department
  5400 Bishop Rd.
  Cheyenne, WY 82006

  Brian Kelly
  US Fish and Wildlife Service
  4000 Airport Parkway
  Cheyenne, WY 82801

- Archaeology — Wyoming State Historic Preservation Office
  2301 Central Ave.
  Cheyenne, WY 82002

- Hydrology   Mark Taylor, PG Hydrogeologist
  WDEQ-LQD, District III
  1866 South Sheridan Ave.
  Sheridan, WY 82801

2 ALTERNATIVES

2.1 NO-ACTION ALTERNATIVE

Under the provisions of the National Environmental Policy Act (NEPA), one alternative that must be considered in each environmental review is the no-action alternative. In this case, the no-action alternative would mean that the United States Nuclear Regulatory Commission (NRC) would not approve the Moore Ranch license application and would not issue a Source Materials License. ISR uranium mining would not occur in the Moore Ranch area and the associated environmental impacts would not occur.

2.1.1 Impacts of the No-Action Alternative

The no-action alternative would result in significant financial impacts to EMC and to Campbell County, Wyoming and the surrounding area. EMC has invested significant resources to develop the Moore Ranch Project that would be irretrievably lost under the no action alternative. In addition, the no action alternative would adversely affect the economic growth of Campbell County. As discussed in further detail in Section 7, the Moore Ranch Project is expected to provide a significant economic impact to the local economy.

A decision to not issue a Source Materials License to EMC would leave a large resource unavailable for energy production supplies. Although EMC is continuing to develop estimates of the reserves at Moore Ranch, the current estimated resource is 5.8 million pounds U_3O_8.

In 2006, total domestic U.S. uranium production was approximately 4.7 million pounds U_3O_8. During the same year, domestic U.S. uranium consumption was approximately 67 million pounds U_3O_8. The Moore Ranch project represents an important new source of domestic uranium supplies that are essential to provide a continuing source of fuel to power generation facilities.

In addition to leaving a large deposit of valuable mineral resources untapped, a denial of this license application would result in adverse economic affects on the individuals that have surface leases with EMC and own the mineral rights in the Moore Ranch Project Area.

2.2 PROPOSED ACTION

2.2.1 Licensing Action Requested

Energy Metals Corporation US (EMC) is providing this Environmental Report (ER) in support of an application to the NRC for a Radioactive Source Materials License to develop and operate the Moore Ranch Project, located in Campbell County, Wyoming, by in situ recovery (ISR) methods. The proposed project will consist of injection/production wellfields, a central plant with ion exchange, resin unloading, elution, precipitation, and yellowcake drying capabilities, and deep injection disposal well(s). EMC controls the uranium resources on the proposed property.

2.2.2 Moore Ranch Project Background

The original development of what is now the Moore Ranch Project was conducted by a joint venture between Conoco, Kerr McGee Uranium, and Wold Uranium with Conoco controlling approximately 50% of the joint venture. The project was referred to as the Moore Ranch Mine and Sand Rock Mill Project and much of the exploration and license related work was conducted from the mid-1970s through the early-1980s. Conoco reported discovery and delineation of several mineralized areas in the vicinity.

Conoco delineated 3 planned open pit areas with drilling on 50-foot centers and completed approximately 130 core holes on the property. Applications were developed for both a WDEQ-LQD mine permit and a USNRC Source Materials License, including all required baseline information. A draft Environmental Statement was completed by the NRC for the Sand Rock Mill Project in March 1982. However, declining uranium market conditions forced development and licensing activities of the project to cease.

2.2.3 Corporate Entities Involved

This License Application and Environmental Report (ER) were prepared and are submitted by Energy Metals Corporation (US), a wholly-owned subsidiary of Energy Metals Corporation (EMC). EMC is a Canadian Corporation with Corporate Headquarters in Vancouver, British Columbia, Canada. EMC (US) maintains a Corporate Headquarters in Edmond, Oklahoma with regional offices in Casper, Wyoming and Corpus Christi, Texas.

On August 10, 2007, Uranium One acquired all outstanding shares of EMC. Uranium One is a Canadian Corporation, also headquartered in Vancouver, British Columbia, Canada. Consolidation and organization of EMC with Uranium One is currently in progress with expected completion in approximately six months. Depending on the outcome of the consolidation and organization process, EMC or its successor organization may submit amended Corporate Entity information to the NRC.

2.2.4 Site Location and Description

The site location and general description of the proposed Moore Ranch Project was provided in Section 1.2. The proposed License Area for the Moore Ranch property contains approximately 7,110 acres. The total surface area to be affected by the proposed operation is within the License Area and will total less than 150 acres. The wellfields, central plant/offices/shop facilities, and two deep disposal wells are the significant surface features associated with the uranium in situ recovery mining operations. There are no evaporation or holding ponds planned for the Moore Ranch Project at this time.

The proposed total wellfield area to be used for the injection and recovery of solution over the ten-year mine life will be approximately 150 acres. The areas will be fenced to limit access by livestock to wellfield areas and will be slightly greater than that encompassed by the areas to be mined. The Moore Ranch Project will have wellfields, a small office, central plant including ion exchange (IX) columns, construction and maintenance shop, warehouse, water treatment equipment, resin transfer facilities, pumps for injection of lixiviant, a small laboratory and employee break room.

Other mineralized trends exist within the current proposed license area, but have not been extensively explored. If future exploration shows potential for development of these other existing trends, then appropriate baseline evaluations will be made at that time.

2.2.5 Orebody

The targeted mineralized zone for in situ uranium recovery at Moore Ranch is the 70 Sandstone at a depth that varies from 180 feet to 250 feet. The overall width of the mineralized area varies from 100 feet to 1000 feet. The orebody ranges in grade from less than 0.05% to greater than 0.5% U3O8, with an average grade estimated at 0.1% U3O8. Additional mining targets may exist in the area at greater depths. Additional future delineation will be needed to fully define any deeper targets.

Typical stratigraphic intervals to be mined are shown in the geologic cross sections contained in Section 3.3. For ISR wellfields, the production zone is the geological sandstone unit where the recovery solutions are injected and produced.

2.2.6 Well Construction and Integrity Testing

2.2.6.1 Well Materials of Construction

The well casing material will be polyvinyl chloride (PVC) with schedule 40 wall thickness and a nominal 5-inch outside diameter. However, if a larger pump size is necessary, larger diameter casing may be utilized. The table below shows the range of casing sizes that could be used at Moore Ranch, and the corresponding drill hole size to ensure adequate annular sealing. Each joint of the PVC casing will normally have a length of approximately 20 feet. Each joint will be connected either with glue and self-tapping screws or joined mechanically (with pipe threads or a water tight o-ring seal with a high strength nylon spline).

Casing	I.D.	O.D.	Bit size
4.5"	4.454	4.950	7-7/8
5.0"	5.047	5.563	8-3/4
6.0"	6.065	6.625	9-7/8

2.2.6.2 Well Construction Methods

Pilot holes for monitor, recovery, and injection wells are drilled to the bottom of the target completion interval with a small rotary drilling unit using native mud and a small amount of commercial drilling fluid additive for viscosity control. The hole is logged, reamed, casing set, and cemented to isolate the completion interval from all other aquifers. The cement is placed by pumping it down the casing and forcing it out the bottom of the casing and back up the casing-drill hole annulus. The pilot holes will be large enough in diameter to provide at least three inches of annulus space.

Typical well completion schematics for recovery wells, injection wells, and monitor wells are shown on Figure 2.2-1.

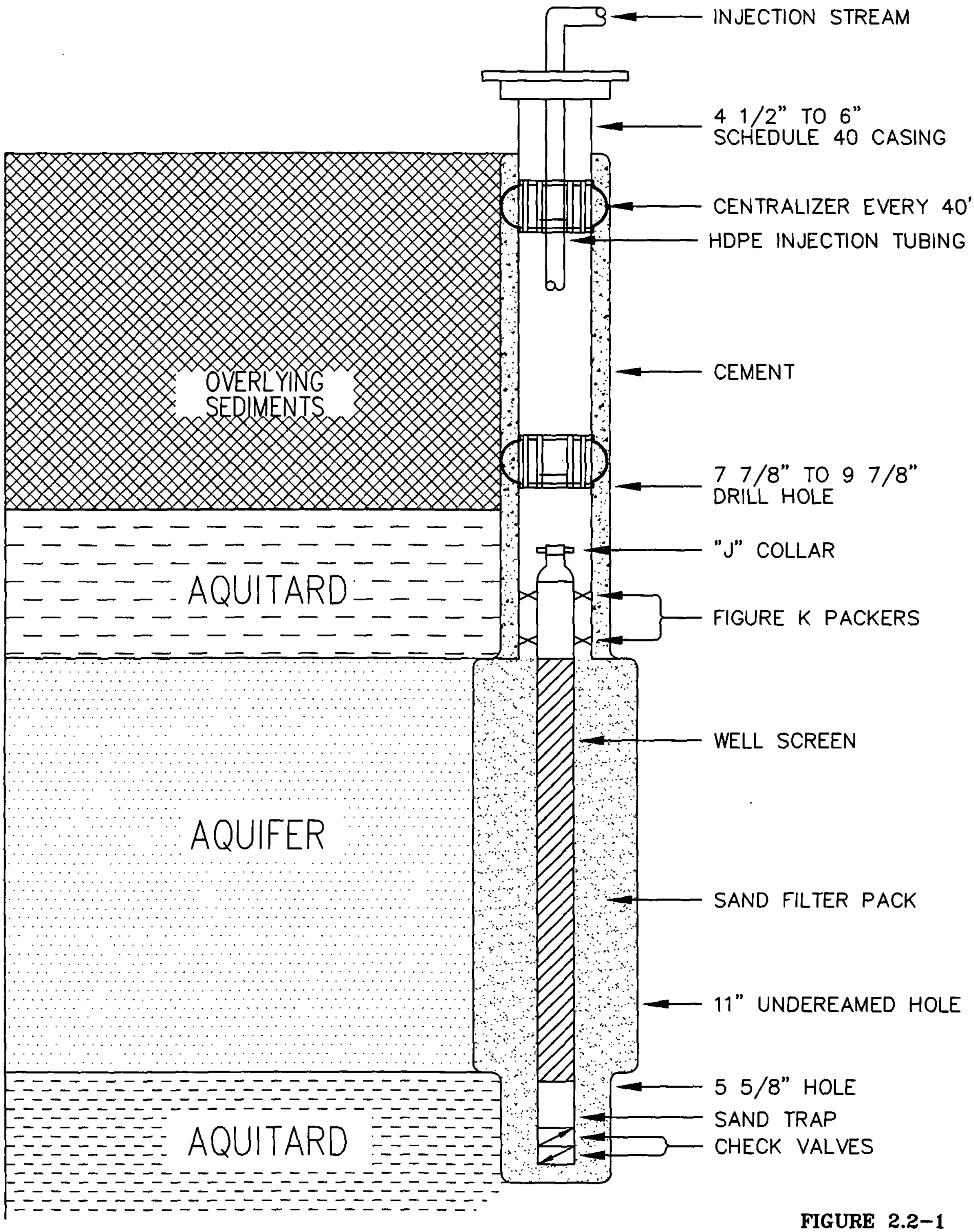


FIGURE 2.2-1

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NO.	DATE	BY

MOORE RANCH URANIUM PROJECT

TYPICAL WELL COMPLETION

CAMPBELL COUNTY, WYOMING

Casing centralizers, located approximately every 40 feet above the casing shoe, are normally run on the casing to ensure it is centered in the drill hole. Effective sealing materials shall consist of neat cement slurry, sand-cement grout, or bentonite clay mixtures meeting State requirements described in Section 6, Chapter 11 of the Wyoming Land Quality Division (LQD) Non Coal Rules and Regulations or equivalent. The purpose of the cement or other sealing materials is to stabilize and strengthen the casing and plug the annulus of the hole to prevent vertical migration of solutions. The volume of cement used in each well is determined by estimating the volume required to fill the annulus and ensure cement returns to the surface. In almost all cement jobs, returns to the surface are observed. In rare instances, however, the drilling may result in a larger annulus volume than anticipated and cement may not return all the way to the surface. In these cases the upper portion of the annulus will be cemented from the surface to backfill as much of the well annulus as possible and stabilize the wellhead. This procedure may be performed by placement of a tremie pipe from the surface as far down into the annulus as possible to the nearest centralizer (40 feet), or by simply backfilling from the surface if use of a tremie pipe is impractical. Cement is pumped into the annulus until return to the surface is observed.

After the well is cemented to the surface and the cement has set, the well is drilled out and completed either as an open hole or it is fitted with a screen assembly (slotted liner), which may have a sand filter pack installed between the screen and the underreammed formation. The well is then air lifted to remove any remaining drilling mud and/or cuttings until well fluids are clear. A small submersible pump is frequently run in the well for final clean-up and sampling (where necessary).

A well completion report is completed on each well. These data are kept available on-site for review or submitted to the Land Quality Division upon request.

2.2.6.3 Well Development

Following construction (and before baseline water quality samples are taken for restoration and monitoring wells), the wells must be developed to restore the natural hydraulic conductivity and geochemical equilibrium of the aquifer. All wells are initially developed immediately after construction using air lifting, swabbing or other accepted development techniques. Well development removes water and drilling fluids from the casing and borehole walls along the screened interval. The primary goal for well development is to allow formation water to enter the well screen. This process is necessary to allow representative samples of groundwater to be collected, and to ensure efficient injection and recovery operations.

Before obtaining baseline samples from monitor or restoration wells, the well must be further developed to ensure that representative formation water is available for sampling.

Final development is performed by pumping the well or swabbing for an adequate period to ensure that stable formation water is present. Monitoring for pH and conductivity is performed during this process to ensure that development activities have been effective. The field parameters must be stable at representative formation values before baseline sampling will begin.

2.2.6.4 Well Integrity Testing

Field-testing of all (i.e., injection, recovery, and monitor) wells is performed to demonstrate the mechanical integrity of the well casing. This mechanical integrity test (MIT) is performed using pressure-packer tests. In the MIT, the bottom of the casing adjacent to or below the confining layer above the production zone is sealed with a plug, downhole packer, or other suitable device. The top of the casing is then sealed in a similar manner or with a threaded cap, and a calibrated pressure gauge is installed to monitor the pressure inside the casing. The pressure in the sealed casing is then increased to 120% of the maximum operating pressure. A well must maintain 90% of this pressure for 10 minutes to pass the test. EMC will test all well casings at a pressure of 150 psi (maximum operating pressure) plus the 20% safety factor, for a total test pressure of 180 psi.

If there are obvious leaks, or the pressure drops by more than 10% during the 10 minute period, the seals and fittings on the packer system will be reset and/or checked and another test is conducted. If the pressure drops less than 10% the well casing is considered to have demonstrated acceptable mechanical integrity.

If a well casing does not meet the MIT criteria, the well will be taken out of service and the casing may be repaired and the well re-tested or plugged and abandoned. The WDEQ-LQD will be notified of any well that fails the MIT. If a repaired well passes the MIT, it will be employed in its intended service following approval from the LQD Administrator that the well has demonstrated mechanical integrity. If the well defect occurs at depth, the well may be plugged back and re-completed for use in a shallower zone provided it passes the MIT. If an acceptable test cannot be obtained after repairs, the well will be plugged and abandoned.

In addition to the initial testing after well construction, a MIT will be conducted on any well after any repair where a downhole drill bit or underreaming tool is used. Any injection well with evidence of suspected subsurface damage will require a new MIT prior to the well being returned to service. In accordance with WDEQ and EPA requirements, MITs are repeated once every five years for all wells.

The MIT of a well will be documented to include the well designation, date of the test, test duration, beginning and ending pressures, and the signature of the individual responsible for conducting the test. Results of the MITs are maintained on site and are available for inspection by NRC and WDEQ. In accordance with WDEQ and EPA requirements, the results of MITs are reported to the WDEQ on a quarterly basis.

2.2.7 Wellfield Design and Operation

The proposed Moore Ranch wellfield map is shown in Figure 2.2-2. The map is preliminary based on EMC's current knowledge of the area and the installation of three wellfields. As the Moore Ranch Project is developed, the wellfield map will be updated accordingly.

The wellfield injection/recovery pattern employed is based on the conventional square five spot pattern which is modified as needed to fit the characteristics of the orebody (see Figure 2.2-3). The standard production cell for the five spot pattern contains four injection wells surrounding a centrally located recovery well. The cell dimensions vary depending on the formation and the characteristics of the orebody. The injection wells in a normal pattern are expected to be between 75 feet and 150 feet apart. All wells will be completed so they can be used as either injection or recovery wells, so that wellfield flow patterns can be changed as needed to improve uranium recovery and restore the groundwater in the most efficient manner. Other wellfield designs include alternating single line drives.

Within each wellfield, more water is produced than injected to create an overall hydraulic cone of depression in the production zone. Under this pressure gradient the natural groundwater movement from the surrounding area is toward the wellfield providing additional control of the recovery solution movement. The difference between the amount of water produced and injected is the wellfield "bleed."

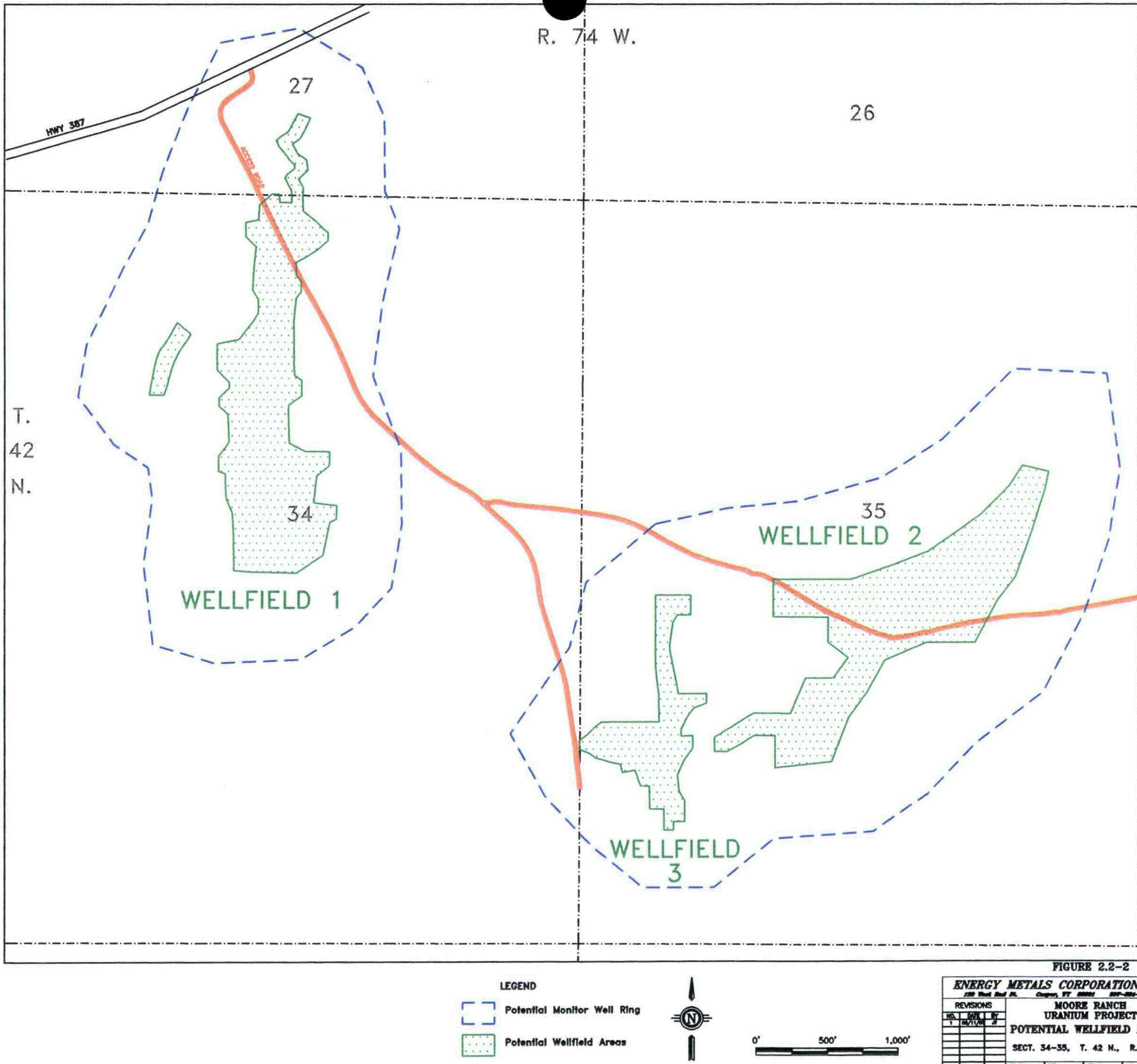

FIGURE 2.2-2

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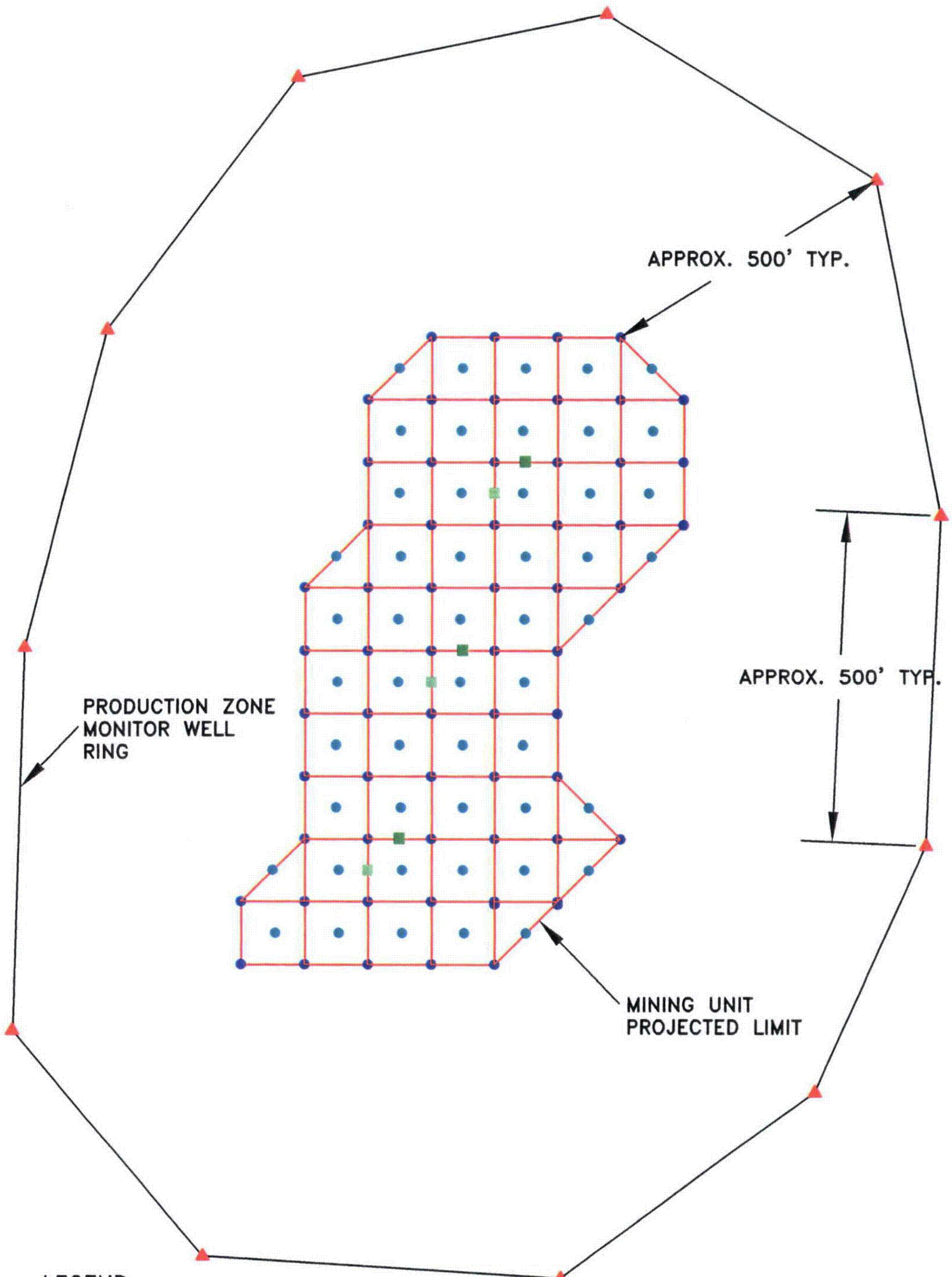
MOORE RANCH
URANIUM PROJECT

POTENTIAL WELLFIELD AREAS

SECT. 34-35, T. 42 N., R. 75 W.



LEGEND

- INJECTION WELL
- PRODUCTION WELL
- PRODUCTION ZONE MONITOR WELL
- OVERLYING AQUIFER MONITOR WELL
- UNDERLYING AQUIFER MONITOR WELL

FIGURE 2.2-3

ENERGY METALS CORPORATION, US

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MOORE RANCH URANIUM PROJECT

TYPICAL WELLFIELD LAYOUT

CAMPBELL COUNTY, WYOMING

GEOL. BY:	DATE:	APPR. BY:	DATE:	SHT. NO.
ENG. BY:	DATE:	APPR. BY:	DATE:	
DRAFT. BY:	DATE:	SCALE:	FILE:	

The minimum over production or bleed rates will be a nominal 0.5% of the total wellfield production rate and the maximum bleed rate typically approaches 1.5%. Bleed rates will be adjusted as necessary to ensure that the wellfield cone of depression is maintained.

Each injection well and recovery well is connected to the respective injection or recovery manifold in a wellfield headerhouse building. The manifolds deliver the recovery solutions to the pipelines carrying the solutions to and from the ion exchange facilities. Flow meters and control valves are installed in the individual well lines to monitor and control the individual well flow rates and pressures. Wellfield piping is constructed of high density polyethylene (HDPE), polyvinyl chloride (PVC), and/or steel. The wellfield piping will typically be designed for an operating pressure of 150-300 psig, and it will be operated at pressures equal to or less than the rated operating pressure of the pipe and other in-line equipment. If a higher design pressure is needed, the pressure rating of the materials will be evaluated and if necessary, materials with a higher pressure rating will be used.

The individual well lines and the trunk lines to the ion exchange facility are buried to prevent freezing. The use of wellfield headerhouses and buried lines is a proven method for protecting pipelines. A typical wellfield development pattern is illustrated in Figure 2.2-3.

Monitor wells will be placed in the mining zone and in the first significant water-bearing sand above (overlying) the mining zone and below (underlying) the mining zone. All monitor wells will be completed using the well construction and testing methods discussed above and developed prior to recovery solution injection. Typical locations of the monitor well rings for the proposed wellfields are shown in Figure 2.2-3. As previously noted, the map is based on EMC's current knowledge of the area. As the project is developed, the wellfield map will be updated accordingly.

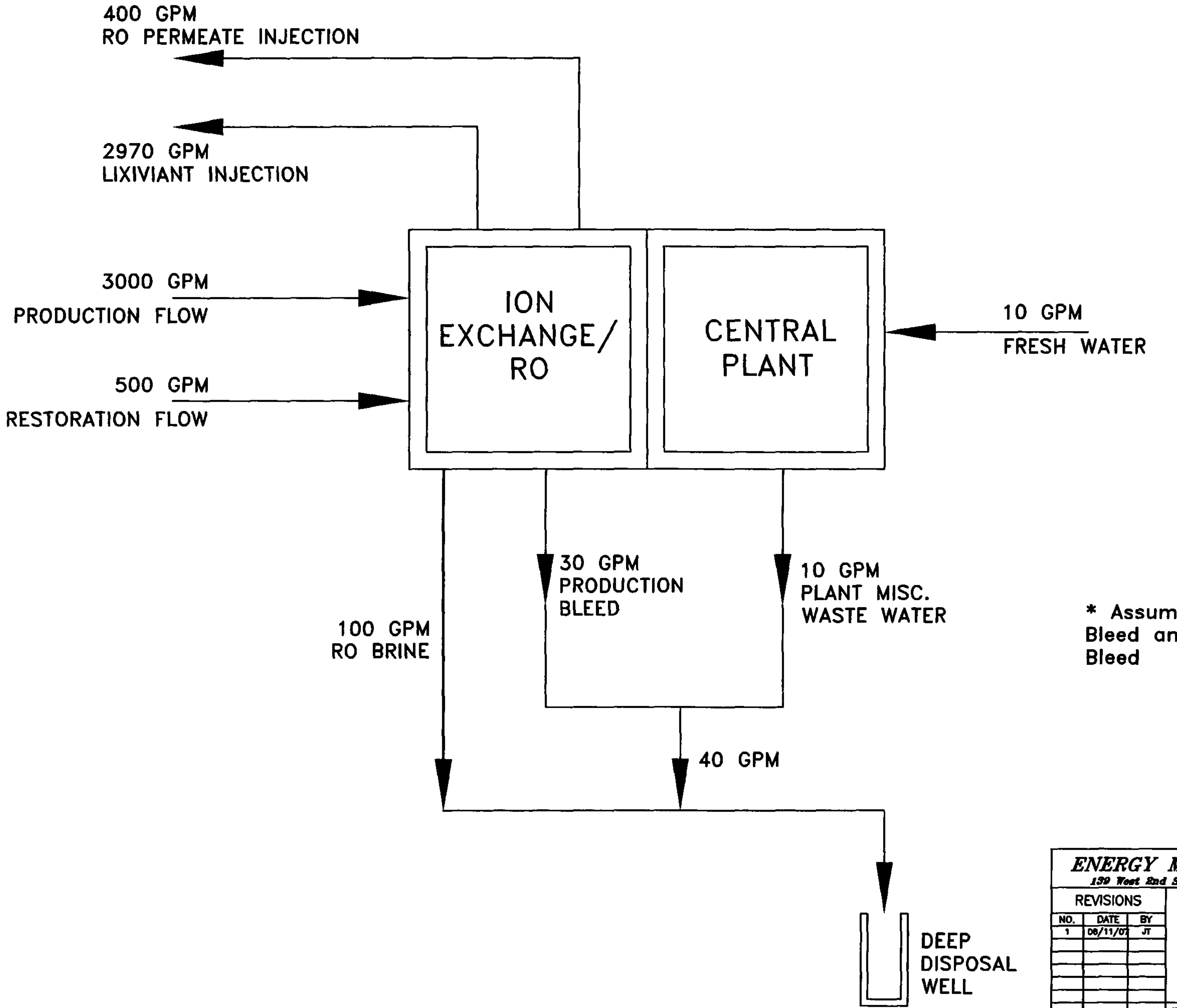
Injection of solutions for mining will be at a maximum rate of approximately 3,000 gpm. A water balance for the proposed Moore Ranch Project is shown on Figure 2.2-4. The liquid waste generated at the central plant will be primarily the production bleed which is estimated at an average of 1% of the production flow. At 3,000 gpm, the average volume of liquid waste generated by production bleed is 30 gpm. EMC proposes to dispose of the liquid waste through deep disposal well injection.

As stated, a bleed rate of approximately 30 gpm from the 70 sand is anticipated during full scale operations. As demonstrated from the limited drawdown during the regional aquifer testing, this amount of consumptive use will generate negligible drawdown outside of wellfield areas. As a result, no impact to other users of groundwater is expected since there are no other existing users of groundwater in the 70-sand within the immediate proximity to the wellfield areas. For the same reasons, no impacts to water users outside of the proposed license boundary are expected. Impacts to groundwater from consumptive use are discussed in detail in Section 4.4.2. Furthermore, since coal bed methane (CBM) wells in the area are completed at far greater depths separated by several confining layers, there are no foreseen impacts to CBM operations as a result of the consumptive use of groundwater in the 70-sand.

Downhole injection pressures will be maintained below the formation fracture pressure. The formation fracture pressure gradient commonly used is 1.0 psi for every 1 foot of depth to the top of the screened interval. At Moore Ranch, the depth to the top of the anticipated screened interval varies from approximately 160 feet in Wellfield 3 to 300 feet in Wellfield 1. Accordingly, injection pressures will range from 100 psi at the headerhouses located in shallower ore areas to no greater than 150 psi at the headerhouses located in deeper ore areas. Well casing integrity will be tested at 150 psi plus a 20% engineering factor, or 180 psi.

2.2.7.1 Wellfield Operational Monitoring

As discussed in Section 6 of this ER, an extensive water-sampling program will be conducted prior to, during and following mining operations at the Moore Ranch project to identify any potential impacts to water resources of the area. The groundwater monitoring program is designed to establish baseline water quality prior to mining; detect excursions of lixiviant either horizontally or vertically outside of the production zone during mining; and determine when the production zone aquifer has been adequately restored following mining.



* Assuming 1% Production Bleed and 20% Restoration Bleed

FIGURE 2.2-4

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MOORE RANCH
URANIUM PROJECT
WATER BALANCE

SECT. 34-35, T. 42 N., R. 75 W.

2.2.8 Process Description

Uranium in situ recovery is a process that takes place underground, or in-place, by injecting lixiviant (recovery) solutions into the ore body and then recovering these solutions when they are rich in uranium. The uranium rich solutions (pregnant lixiviant) are then pumped from recovery wells (production wells) to the central plant ion exchange system for extraction. The uranium recovery process utilizes the following steps:

1. Injection of lixiviant: oxidation and complexation of the uranium underground;
2. Loading of uranium complexes onto an ion exchange resin;
3. Reconstitution of the recovery solution by addition of carbon dioxide and/or sodium bicarbonate and an oxidant;
4. Elution of uranium complexes from the resin;
5. Precipitation of uranium.

2.2.8.1 In Situ Reactions

The lixiviant is the recovery solution which is used to solubilize the uranium from the ore deposit. The composition is designed to reverse the natural geochemical conditions which led the to original uranium deposition. The project will use a carbonate/or bicarbonate recovery solution consisting of varying concentrations and combinations of sodium carbonate (Na_2CO_3), sodium bicarbonate ($NaHCO_3$), oxygen, and carbon dioxide (CO_2) added to the native groundwater to promote the dissolution of uranium as a uranyl carbonate complex. The lixiviant is typically made up on a batch basis in the plant and added continuously to the injection stream. The expected or typical lixiviant concentration and composition is shown in Table 2.2-1.

Table 2.2-1: Typical Lixiviant Concentrations

SPECIES	RANGE (mg/L)	
	Low	High
Na	≤ 400	6000
Ca	≤ 20	500
Mg	≤ 3	100
K	≤ 15	300
CO_3	≤ 0.5	2500
HCO_3	≤ 400	5000
Cl	≤ 200	5000
SO_4	≤ 400	5000
U_3O_8	≤ 0.01	500
V_2O_5	≤ 0.01	100
TDS	≤ 1650	12000
pH	< 6.0	8.0

* All values in mg/l except pH (units).

NOTE: The above values represent the concentration ranges that could be found in barren lixiviant or pregnant lixiviant and would include the concentration normally found in "injection fluid".

The chemistry of in situ recovery involves an oxidation step to convert the uranium in the solid state to a form that is easily dissolved by the recovery solution. The reactions representing these steps at a neutral or slightly alkaline pH are:

Oxidation: $UO_{2\,(solid)} + \frac{1}{2} O_{2\,(in\ solution)} + 2H^{+} \rightarrow UO_{3\,(at\ solid\ surface)}$

Dissolution: $UO_3 + 2\,HCO_3^{-1} \rightarrow UO_2(CO_3)_2^{-2} + H_2O$

$UO_3 + CO_3^{-2} + 2HCO_3^{-1} \rightarrow UO_2(CO_3)_3^{-4} + H_2O$

The principal uranyl carbonate ions formed as shown above are uranyl dicarbonate, $UO_2(CO_3)_2^{--2}$, (UDC), and uranyl tricarbonate $UO_2(CO_3)_3^{-4}$, (UTC). The relative abundance of each is a function of pH and total carbonate strength.

2.2.8.2 Uranium Extraction

The process flow sheet depicting the uranium extraction process as planned for the central plant is shown in Figure 2.2-5. The recovery of uranium from the pregnant lixiviant in the Moore Ranch Facility will take place in the ion exchange columns. The uranium bearing recovery solution enters the pressurized downflow ion exchange column and passes through the resin bed. A uranium specific ion exchange resin, such as Dowex 21K or equivalent, is used. The uranium complexes in solution are loaded onto the ion exchange resin in the column. This loading process is represented by the following chemical reaction:

$2\,R\,HCO_3 + UO_2(CO_3)_2^{-2} \rightarrow R_2UO_2(CO_3)_2 + 2HCO_3^{-1}$

$2\,RCl + UO_2(CO_3)_2^{-2} \rightarrow R_2UO_2(CO_3)_2 + 2Cl^{-}$

$R_2SO_4 + UO_2(CO_3)_2^{-2} \rightarrow R_2UO_2(CO_3)_2 + SO_4^{-2}$

As shown in the reaction, loading of the uranium complex results in simultaneous displacement of chloride, bicarbonate or sulfate ions.

The now barren lixiviant passes from the ion exchange columns to be reinjected into the formation. The solution is refortified with the sodium carbonate/bicarbonate based lixiviant as required and pumped to the wellfield for reinjection into the formation.

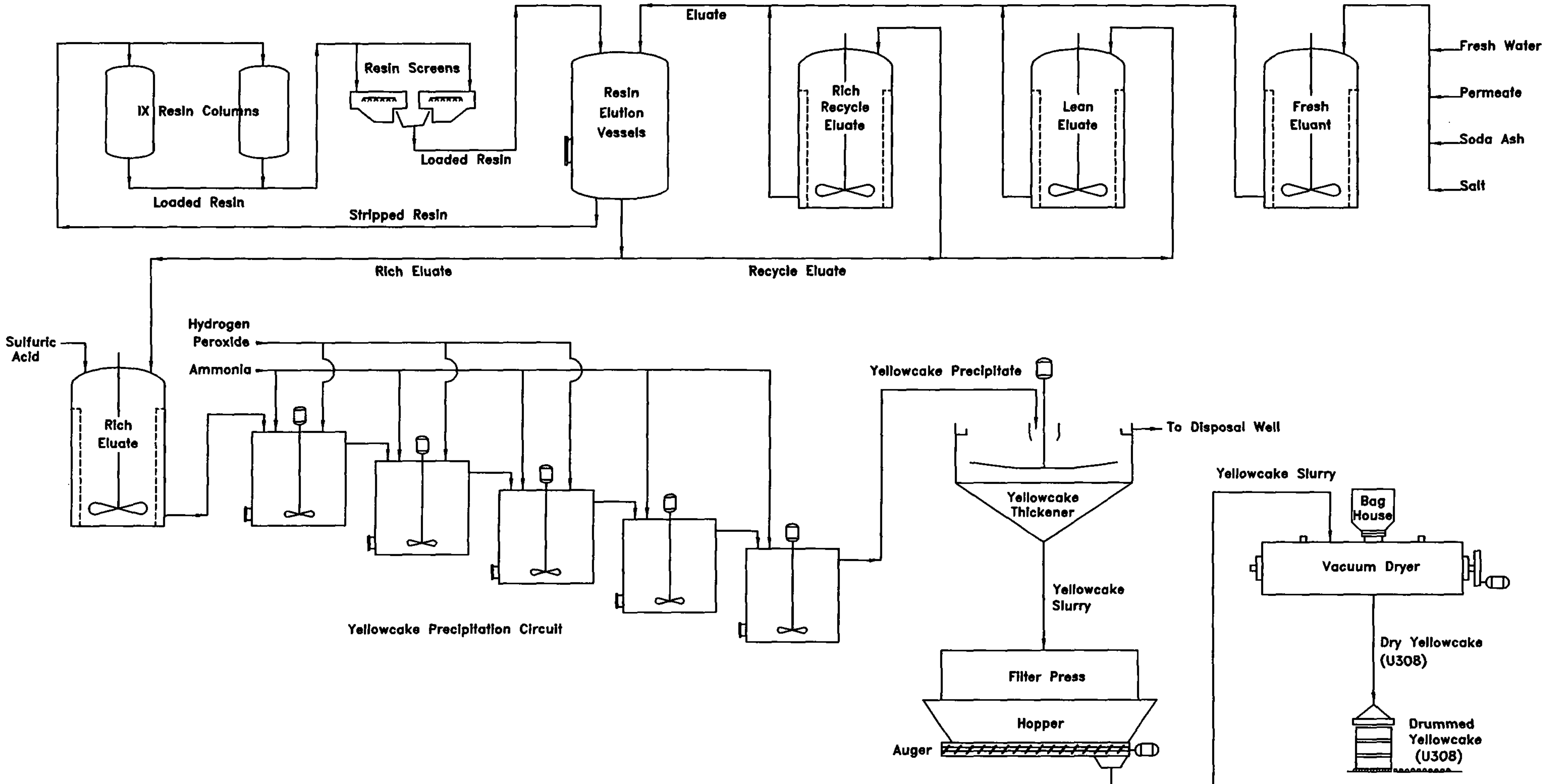

FIGURE 2.2-5

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MOORE RANCH
URANIUM PROJECT
PROCESS FLOW DIAGRAM

SECT. 34-35, T. 42 N., R. 75 W.

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1	07/13/07	JT

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2.2.8.3 Resin Transfer and Elution

Once the ion exchange resin in an IX column is loaded to capacity with uranium complexes, the column will be taken out of service. The resin loaded with uranium will be transferred from the IX column to the elution circuit. Once the resin has been stripped of the uranium by the process of elution, the resin will be returned to the appropriate column for reuse in the ion exchange circuit. In the elution circuit the loaded resin will be stripped of uranium by a process based on the following chemical reaction:

$$R_2UO_2(CO_3)_2 + 2Cl^- + CO_3^{-2} \longrightarrow 2\,RCl + UO_2(CO_3)_3^{-2}$$

After the uranium has been stripped from the resin, the resin may be rinsed with a sodium bicarbonate solution. This rinse removes the high chloride eluant physically entrained in the resin and partially converts the resin to bicarbonate form. In this way, chloride ion buildup in the lixiviant can be controlled.

2.2.8.4 Precipitation

When a sufficient volume of pregnant eluant is held in storage, it is acidified with either sulfuric acid to break the uranyl carbonate complex ion and liberate carbonate ions as carbon dioxide. The solution is agitated to assist in removal of the resulting CO_2. The decarbonization can be represented as follows:

$$UO_2(CO_3)_3^{-4} + 6H^+ \longrightarrow UO_2^{++} + 3\,CO_2\uparrow + 3H_2O$$

Anhydrous ammonia is then added to raise the pH to a level conducive for precipitating uranium crystals.

Hydrogen peroxide is then added to the solution to precipitate the uranium according to the following reaction:

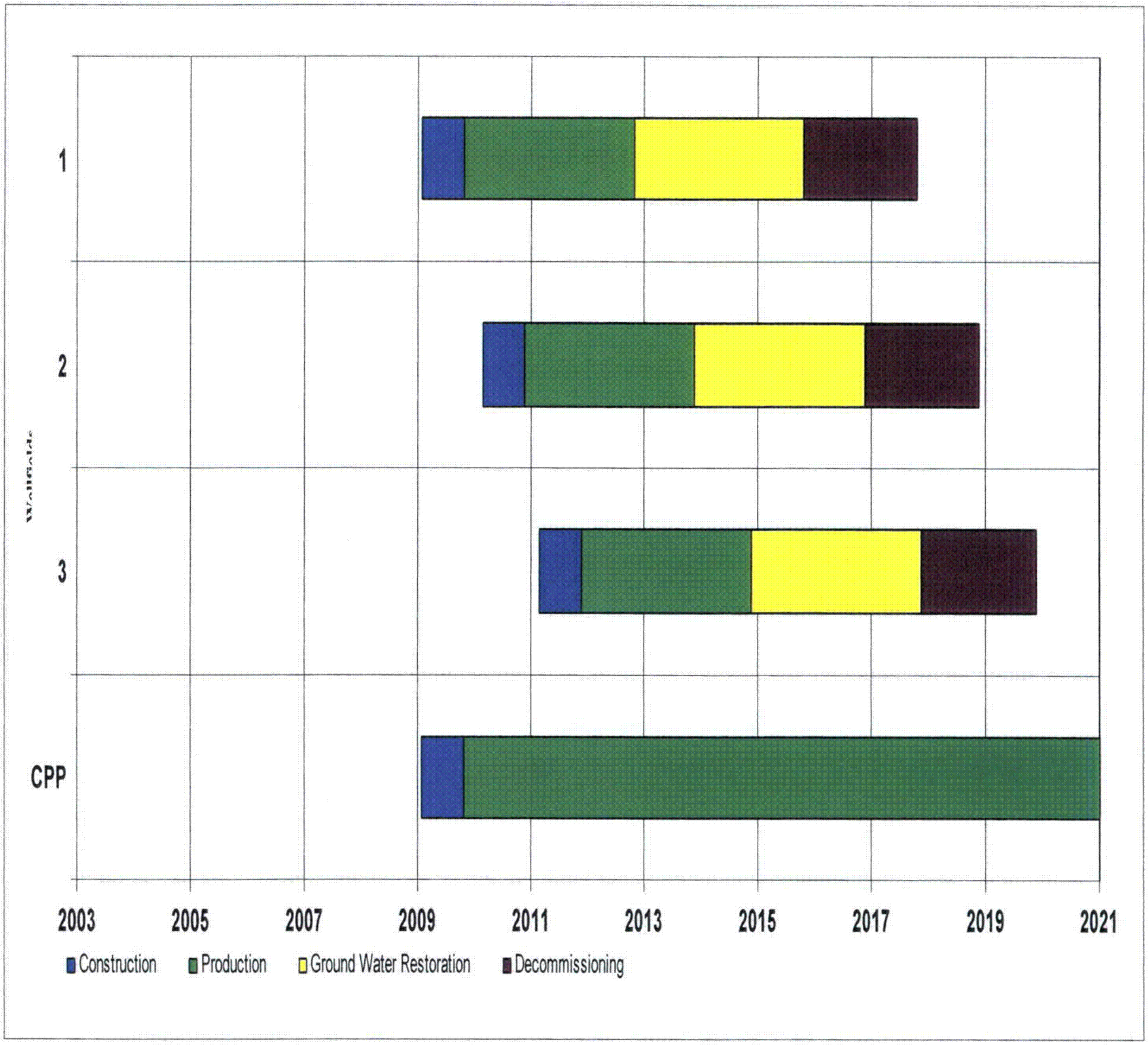
$$UO_2^{++} + H_2O_2 + 2H_2O \xrightarrow{NH_3} UO_4 \bullet 2H_2O + 2H^+$$

The precipitated uranyl peroxide slurry is pH adjusted, allowed to settle, and the clear solution decanted. The decant solution is recirculated back to the barren makeup tank, sent to fresh salt brine makeup, or sent to waste. The thickened uranyl peroxide "slurry" is further dewatered and washed. The solids discharge is either sent to the vacuum dryer for drying before shipping or is sent to storage for shipment as slurry to a licensed recovery or conversion facility.

2.2.9 Proposed Operating Schedule

The proposed Moore Ranch mine schedule is shown in Figure 2.2-6. The mine schedule is preliminary based on EMC's current knowledge of the area and the installation of three wellfields. As the Moore Ranch Project is developed, the mine schedule will be updated accordingly.

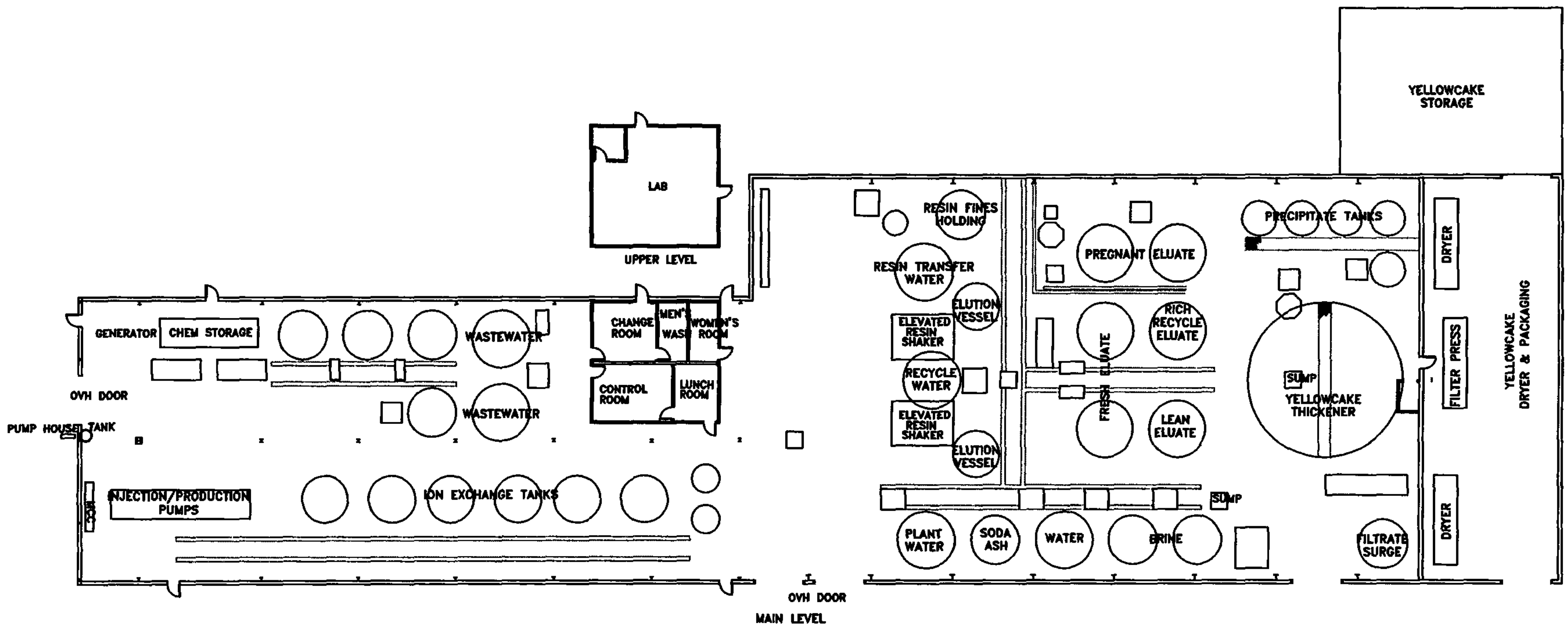
Figure 2.2-6: Proposed Moore Ranch Operations Schedule



2.3 CENTRAL PLANT AND CHEMICAL STORAGE FACILITIES; EQUIPMENT USED AND MATERIAL PROCESSED

The uranium recovery process described in the preceding section will be accomplished in several steps. Uranium recovery from the solution by ion exchange, subsequent processing of the loaded ion exchange resin to remove the uranium (elution), the precipitation of uranium, and the dewatering and packaging of solid uranium (yellowcake) will be performed at the central plant.

The central plant will not only serve production from Moore Ranch ISR operations, but is also planned to process resin from other potential EMC satellite projects in the area, or potential tolling arrangements with other in situ operations licensed under a different operator. The central plant will be initially designed and constructed to produce 2 million pounds of U_3O_8 per year (see Figure 2.3-1 for layout). Capacity is expected to be expanded to 4 million pounds per year as these other potential satellite projects are licensed and production increases (see Figure 2.3-2 for expanded facility layout).



0 20 40

FIGURE 2.3-1

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MOORE RANCH URANIUM PROJECT

CENTRAL PLANT LAYOUT

SECT. 34-35, T. 42 N., R. 75 W.

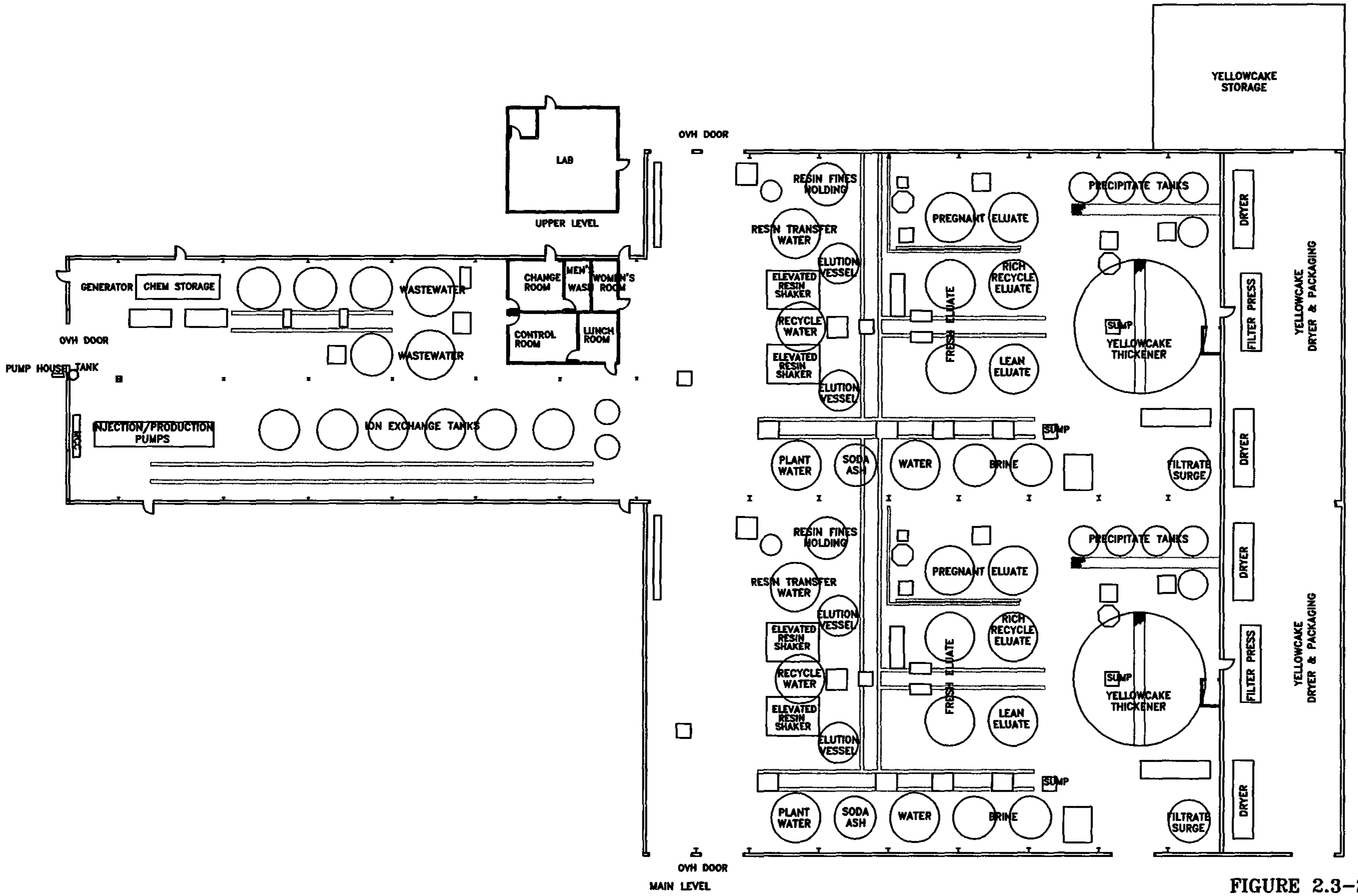

FIGURE 2.3-2

0 20 40

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MOORE RANCH URANIUM PROJECT

EXPANDED CENTRAL PLANT LAYOUT

SECT. 34-35, T. 42 N., R. 75 W.

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2.3.1 Moore Ranch Central Plant Equipment

The initial Moore Ranch central plant facilities will be housed in a building approximately 350 feet long by 100 feet wide. The building width (with the exception of the ion exchange area) will likely double to accommodate the future planned expansion. The central plant includes the following systems:

- Ion exchange;
- Resin transfer
- Chemical addition
- Filtration
- Elution Circuit
- Precipitation Circuit
- Product Filtering, Drying and Packaging, and
- Liquid Waste Stream Circuit.

Based on preliminary design and site geotechnical evaluations, the Moore Ranch central plant will be located within an 11 acre fenced area in the NW ¼¼, Section 34, T42N, R75W. This area will also contain the deep disposal well and chemical storage areas. Figure 2.3-2 shows the plan view of the expanded central plant.

2.3.1.1 Flow and Material Balance – Ion Exchange

The uranium-bearing solution or pregnant lixiviant pumped from the wellfield is piped to the ion exchange plant for extraction of the uranium by use of ion exchange units. The ion exchange system consists of eight fixed bed ion exchange vessels. The ion exchange vessels will be operated as three sets of two vessels in series with two vessels available for restoration. The ion exchange system is designed to process recovered solution at a rate of 3,000 gpm with each vessel sized for 500 cubic feet of resin operated in a pressurized downflow mode. As the solution passes through the IX resin in the IX vessels the uranyldicarbonate and uranyltricarbonate are preferentially removed from the solution. The barren solutions leaving the ion exchange units normally contain less than 2 mg/l of uranium.

After the barren lixiviant leaves the ion exchange vessels, carbon dioxide and/or carbonate/bicarbonate is added as necessary to return the carbonate/bicarbonate concentration to the desired operating level. The solution is then pumped back to the wellfield, with the oxidant (O_2 gas) added either as it leaves the central plant, or just before the solution is re-injected into the production zone.

Loaded resin from potential future EMC satellite operations or other projects will be transported to the central plant via tanker truck. A pressurized transfer system will be used to transfer resin from the truck to the plant.

2.3.1.2 Flow and Material Balance – Elution System

Using a three stage elution circuit, approximately 33,000 gallons of eluate will contact 500 cubic feet of resin. The first elution stage generates approximately 1,500 ft^3 (11,220 gallons) of pregnant eluate containing 10 to 20 grams per liter U_3O_8. Approximately 1,500 ft^3 (11,220 gallons) of fresh eluate will be required per elution batch. The fresh eluate is prepared by mixing the proper quantities of a saturated sodium chloride (salt) solution and saturated sodium carbonate (soda ash) solution and water to form a solution that is approximately 9% NaCl and 2% Na_2CO_3. The saturated salt solution will be generated in a brine generator and the saturated soda ash solution will be prepared by passing warm water (>105° F) through a bed of soda ash. The eluate is passed through a bank of 10 micron bag filters to remove entrained particulates prior to contacting the resin beds in the elution vessels.

In the three stage elution, the rich eluate is first passed through the elution vessels which contain the IX resin. The rich eluate strips approximately 84% of the uranyl carbonate ions from the resin and becomes pregnant eluate, which then contains approximately 15,500 mg/l of U_3O_8. Next, lean eluate is contacted with the resins and removes approximately 68% of the remaining uranyl carbonate to become rich eluate. Finally, fresh eluate is passed through the resins in the elution vessels and removes approximately 35% of the remaining uranyl carbonate from the resins. This final flush is the lean eluate. At this point, the resins have a residual uranyl carbonate concentration of approximately 3.33%. The resins are washed with fresh water and transferred back to the appropriate vessel or to a resin transfer trailer for transport back to any off-site satellite mining areas. Each batch of eluate will be transferred from the respective eluate storage tank through the elution vessel at a rate of approximately 210 gpm.

2.3.1.3 Flow and Material Balance – Precipitation System

Approximately 210 gallons of sulfuric acid is added to the pregnant eluate to break the uranyl carbonate complex, which liberates carbon dioxide and frees uranyl ions to form a uranyl sulfate ion complex. The acidic, uranium rich fluid is pumped to the first of five agitated tanks arranged in series. The fluid flows by gravity from one tank to the next. Hydrogen peroxide is added to the first two tanks to form an insoluble uranyl peroxide compound. Ammonia is then diffused into solution in the third tank. Compressed air is added to the ammonia stream prior to injection into the tank. Ammonia and air are also diffused into solution into the final tank in series. The addition of ammonia raises the pH of the precipitate solution to near neutral for optimum crystal growth and settling. The uranium precipitate solution is then pumped from the final precipitation tank to a 38-foot diameter gravity thickener.

2.3.1.4 Yellowcake Drying

The thickened yellowcake will be pumped into a plate and frame filter press. The yellowcake is washed by pumping fresh water through the solids in the filter press. Washing removes excess chlorides and other soluble contaminants from the yellowcake. The filtered yellowcake, which is approximately 60% solids, drops from the filter press into a live bottom hopper with a screw auger to move the pressed yellowcake slurry to a sump where a moyno-type positive displacement pump transfers the yellowcake to an indirect fired rotary vacuum dryer. Water is added to the yellowcake in the live bottom hopper to facilitate pumping the solids to the dryer.

The yellowcake will be dried at approximately 250°F. The off gases generated during the drying cycle are filtered through a baghouse, which is located on the top of the dryer, to remove particles down to approximately a 1 micron size fraction. The gases are then cooled and scrubbed in a surface condenser to further remove the smaller size fraction particulates and the water vapor during the drying process. Two rotary vacuum dryers (potentially 4 vacuum dryers after future plant expansion) will be located in a separate building attached to the central plant which will contain the dryers, the baghouses on the dryers and a condenser scrubber and vacuum pump system for each dryer. The dryers will be approximately 20 feet in length and 5 feet in diameter. The dryers will be heated with a heat transfer fluid (Dow-Therm® or equivalent) that circulates through the shell and the rotating central shaft, to which plows are affixed. The plows stir and mix the material in the dryer to facilitate even drying of the solids in the chamber. The heat transfer fluid (HTF) will be heated by two natural gas or propane fired HTF heaters, each provided with HTF pumps for circulating the HTF though the shell and central shaft of the dryer. The HTF heaters and pumps will be located in a shed structure attached to the back of the dryer building. The water-sealed vacuum pumps will provide the vacuum source while the dryer is being loaded and while the yellowcake is unloaded into drums. The major components of the system are described below:

1. Drying Chamber: A horizontal 316 stainless steel vessel heated externally and fitted with rotating plows to stir the yellowcake. The chamber will have a top port for loading the wet yellowcake and a bottom port for unloading the dry powder. A third port will be provided for the venting through the baghouse during the drying procedure.

2. Bag House: This air and vapor filtration unit will be mounted directly above the drying chamber so that any dry solids collected on the bag filter surfaces can be batch discharged back to the drying chamber. The bag house will be heated to prevent condensation of water vapor during the drying cycle. It will be kept under negative pressure by the vacuum system.

3. Condenser: This unit will be located downstream of the bag house and will be water cooled. It will be used to remove the water vapor from the non-condensable gases coming from the drying chamber. The gases are moved through the condenser by the vacuum system. Dust passing through the bag filters is wetted and entrained in the condensing moisture within this unit.

4. Vacuum Pump: The vacuum pump will be a rotary water sealed unit that provides a negative pressure on the entire system during the drying cycle. It will also be used to provide negative pressure during transfer of the dry powder from the drying chamber to fifty-five (55) gallon drums. The water seal of the rotary vacuum pump captures entrained particulate matter remaining in the gas streams.

5. Packaging: The system will be operated on a batch basis. When the yellowcake is dried sufficiently, it will be discharged from the drying chamber through a bottom port into drums. A level gauge, a weigh scale, or other suitable device will be used to determine when a drum is full. Particulate capture will be provided by a sealed hood that fits on the top of the drum, which will be vented through a sock filter to the condenser and the vacuum pump system when the powder is being transferred.

6. Heating: The heat for drying will be supplied by indirect HTF such as Dow-Therm® or other suitable heat transfer fluids. The drying will be accomplished under 250°F and at pressures less than atmospheric.

7. Effluent Monitoring: The vacuum pump discharges to the atmosphere. The water that is collected from the condenser will be recycled to the precipitation circuit, eluant makeup or disposed with other process water. Room air will be monitored routinely for airborne dust.

8. Controls: The system will be instrumented sufficiently to operate automatically and to shut itself down for malfunctions such as heating or vacuum system failures.

2.3.2 Yellowcake Packaging, Storage, and Shipment

The dried yellowcake will be removed from the rotary vacuum dryer by passing through a rotary valve into 55-gallon steel drums, which are placed under a hood for the drum loading. The vacuum pump for the dryer will be connected to the loading hood to minimize particulate emissions during drum loading.

The dried yellowcake product in the steel drums will be stored for shipment within a restricted storage area and shipped by truck to other licensed facilities for further processing. An enclosed warehouse, adjacent to the yellowcake drying area, will be provided for the storage of yellowcake. Onsite inventory of drummed yellowcake typically will be less than 200,000 lbs. However, in periods of inclement weather or other interruptions in product shipments, all production will be stored on-site in designated restricted storage areas.

The drummed yellowcake will be shipped by exclusive use transport to another licensed facility for further processing. All yellowcake shipments will be made in compliance with applicable DOT and NRC regulations.

A discussion of the areas in the proposed plant facility where fumes or gases could be generated can be found in Section 4.12. The potential sources are minimal in the ion exchange process area since the mining solutions contained in the process equipment are maintained under a positive pressure. Building ventilation in the process equipment area will be accomplished by the use of an exhaust system that draws in fresh air and sweeps the plant air out to the atmosphere.

2.3.3 Chemical Storage Facilities

Chemical storage facilities at the Moore Ranch Project will include both hazardous and non-hazardous material storage areas. Bulk hazardous materials, which have the potential to impact radiological safety, will be stored outside and segregated from areas where licensed materials are processed and stored. Bulk storage of hazardous chemicals will be located as to provide adequate separation to avoid mixing of incompatible materials. Also, bulk hazardous materials will be stored outside in areas to provide adequate distance from facilities to minimize hazards to people during an accidental release. Other non-hazardous bulk process chemicals (e.g., sodium carbonate) that do not have the potential to impact radiological safety may be stored within the central plant facilities.

2.3.3.1 Process Related Chemicals

Process-related chemicals stored in bulk at the Moore Ranch Central Plant will include carbon dioxide, oxygen, sodium sulfide, ammonia, sulfuric acid, and/or hydrogen peroxide. Risk assessments completed by the NRC in NUREG-6733 for in situ recovery facilities identified anhydrous ammonia and bulk acid (sulfuric and hydrochloric) storage as the most hazardous chemicals with the greatest potential for impacts to chemical and radiological safety.

- Carbon Dioxide

Carbon dioxide will be stored adjacent to the central plant where it will be added to the lixiviant prior to leaving the central plant.

- Oxygen

Oxygen is typically stored near the central plant or within wellfield areas, where it is centrally located for addition to the injection stream in each headerhouse. Since oxygen readily supports combustion, fire and explosion are the principal hazards that must be controlled. The oxygen storage facility will be located a safe distance from the central plant and other chemical storage areas for isolation. The storage facility will be designed to meet industry standards in NFPA-50.

Oxygen service pipelines and components must be clean of oil and grease since gaseous oxygen will cause these substances to burn if ignited. All components intended for use with the oxygen distribution system will be properly cleaned using recommended methods in CGA G-4.1. The design and installation of oxygen distribution systems is based on CGA-4.4.

- Chemical Reductants

Hazardous materials typically used during groundwater restoration activities include the addition of a chemical reductant (i.e., sodium sulfide or hydrogen sulfide gas). To minimize the potential for accidents involving process chemicals to impact areas where licensed material is handled, these materials are stored outside of process areas. Sodium sulfide may be used as a chemical reductant during groundwater restoration. The material consists of a dry flaked product and is typically purchased on pallets of 55-pound bags or super sacks of 1,000 pounds. The bulk inventory will be stored outside of process areas in a cool, dry, clean environment to prevent contact with any acid, oxidizer, or other material that may react with the product. There are no current plans to use hydrogen sulfide gas at the Moore Ranch Project. However, in the event that EMC determines that use of hydrogen sulfide as a chemical reductant is necessary, proper chemical safety precautions will be taken.

- Ammonia

The anhydrous ammonia storage and distribution system at the proposed Moore Ranch Central Plant will have an initial capacity of approximately 90,000 lbs with potential to double after expansion of the central plant. Administrative controls will limit ammonia storage in the tank to 80% of maximum capacity. Strict unloading procedures will be utilized to ensure that this limit is not exceeded and that other safety controls are in place during the transfer of anhydrous ammonia. Process safety controls will be in place at the central plant where anhydrous ammonia is added to the precipitation circuit. These safety controls include the installation of a process area ammonia detector and alarm and emergency shut off solenoid for isolation of the ammonia distribution system in the event of a major release.

The ammonia system at the central plant will be covered under the EPA's Risk Management Program (RMP) regulations. The RMP regulations require certain actions by covered facilities to prevent accidental releases of hazardous chemicals and minimize potential impacts to the public and environment. These actions include measures such as accidental release modeling, documentation of safety information, hazard reviews, operating procedures, safety training, and emergency response preparedness. Storage and operation of the anhydrous ammonia system will be conducted in compliance with RMP regulations.

Additionally, anhydrous ammonia will have total storage exceeding the screening threshold contained in Appendix A of 6 CFR 27, Chemical Facility Anti-terrorism Final

Interim Standards, Department of Homeland Security. As a result, EMC will be obligated to undergo initial screening requirements as required by the rule.

- Acid Storage

The sulfuric and/or hydrochloric acid storage and distribution systems at the central plant will have an initial capacity of approximately 6,000 gallons. Future capacity will double after expansion of the central plant. Strict unloading procedures are utilized to ensure that safety controls are in place during the transfer of these acids. Process safety controls are also in place at the central plant where sulfuric or hydrochloric acid is added to the precipitation circuit.

Initial anticipated hydrochloric acid storage (6,000 gallons) does not exceed the screening threshold (11,250 lbs) contained in Appendix A of 6 CFR 27, Chemical Facility Anti-terrorism Final Interim Standards, Department of Homeland Security. However, the threshold will be exceeded if capacity is doubled after plant expansion. As a result, EMC will be obligated to undergo initial screening requirements for hydrochloric acid as required by the rule at that time.

- Hydrogen Peroxide

Hydrogen peroxide will be stored outside in a 6,000-gallon tank constructed of aluminum during initial operations. This capacity will double after expansion of the central plant. The storage tank will be stored away from flammable sources, organic materials, and incompatible chemicals (including ammonia) to avoid adverse chemical reactions.

The use of hydrogen peroxide at concentrations greater than 52 percent is subject to the following regulatory programs:

- Process Safety Management of Highly Hazardous Chemicals standard contained in 29 CFR §1910.119 for TQs in excess of 7,500 pounds; and
- Threshold Planning Quantities (TPQs) contained in 40 CFR Part 355, Emergency Response Plans for threshold quantities (TQs) in excess of 1,000 pounds.

The Moore Ranch design includes the use of hydrogen peroxide at a concentration of 50 percent contained in a hydrogen peroxide tank with an initial capacity of 6,000 gallons. With the design hydrogen peroxide concentration and capacity, EMC will not be subject to the aforementioned regulatory programs.

2.3.3.2 Non-Process Related Chemicals

Non-process related chemicals that will be stored at the Moore Ranch Central Plant include petroleum (gasoline, diesel) and propane. Due to the flammable and/or combustible properties of these materials, all bulk quantities will be stored outside of process areas at the plant. All gasoline and diesel storage tanks are located above ground and within secondary containment structures to meet EPA requirements.

2.4 INSTRUMENTATION AND CONTROL

The piping and metering system for production and injection solutions consists of buried trunk lines between the recovery plant and the operating wellfield areas with metering and flow distribution headers in the wellfield headerhouses. The individual well flows and pressures are adjusted and controlled within the headerhouses. Wellfield instrumentation will be provided to measure total production and injection flow. In addition, instrumentation will be provided to indicate the pressure which is being applied to the injection wells. Wellfield headerhouses will be equipped with water sensors and alarms to detect the presence of liquids in the wellfield headerhouses.

Instrumentation will be provided to monitor the total recovery flow into the central plant, the total injection flow leaving the plant, and the total waste flow leaving the plant. Instrumentation will be provided on each injection and production well to record an alarm in the event of a change in flow that might indicate a leak or rupture in the system. In the process areas, tank levels are measured in chemical storage tanks as well as process tanks.

Handheld radiation detection instruments and portable samplers will be used to monitor radiological conditions at the central plant. Specifications for this equipment are discussed in further detail in Section 5 of the Technical Report. The location of monitoring points and monitoring frequency for in-plant radiation safety is also discussed in Section 5 of the Technical Report.

2.4.1 Major Impacts of the Proposed Action

As discussed in detail in Section 4 of this ER, ISR uranium mining has few significant environmental impacts. The two primary impacts of concern are land use and groundwater quality.

2.4.1.1 Land Use Impacts

Construction of the Moore Ranch Central Plant and associated structures will encompass approximately 11 acres. Operation of the Moore Ranch Project will ultimately encompass approximately 150 acres. Use of the land as rangeland will be excluded from this area during the life of the project. Oil and gas production facilities will not be affected. Considering the relatively small size of the area impacted by construction and operation, the exclusion of grazing from this area over the course of the Moore Ranch project will have an insignificant impact on local livestock production.

These impacts to land use are considered temporary and reversible by returning the land to its former grazing use through post-mining surface reclamation. There will be no long-term impacts or institutional controls following decommissioning of the site. EMC will decommission the site following production activities to meet NRC requirements for license termination. Following NRC approval of decommissioning, the site will be returned to its current use.

Impacts on land use are discussed in detail in Section 4.1 of this ER. Mitigation measures to return the license area to its current use following mining and decommissioning activities are summarized in Section 2.4.2.1.

2.4.1.2 Groundwater Impacts

During ISR mining operations, water quality impacts are of concern. Contamination of groundwater from the proposed lixiviant is caused by (1) the addition of sodium bicarbonate and oxygen to the groundwater, (2) the addition of chloride to the groundwater by the processing plant, and (3) the interaction of these chemicals with the mineral and chemical constituents of the aquifer being mined. The result is that during mining, the concentration of most of the naturally occurring dissolved constituents in the mining zone will be appreciably higher than their concentrations in the original groundwater.

In order to conduct ISR mining, the WDEQ and the EPA must approve an aquifer exemption for the mining zone. This exemption from protection under the Safe Drinking Water Act (SDWA) is based on the fact that the mining zone is not currently used and will not be used in the future as an underground source of drinking water (USDW). An aquifer exemption is permanent. However, EMC will be required under WDEQ regulations and NRC license conditions to restore the groundwater in the mining zone to premining class of use. The primary purpose of restoration of the groundwater quality in the mining zone is to protect adjacent aquifers from future impacts.

Impacts on groundwater resources are discussed in detail in Section 4.4 of this ER. Mitigation measures for impacts on groundwater quality are summarized in Section 2.4.2.2.

2.4.2 Mitigation Measures

2.4.2.1 Mitigation of Land Use Impacts

All lands disturbed by the Moore Ranch project will be returned to their pre-mining land use of livestock grazing and wildlife habitat unless an alternative use is justified and is approved by the state and the landowner, i.e. the rancher desires to retain roads or buildings. The objectives of the surface reclamation effort is to return the disturbed lands to production capacity of equal to or better than that existing prior to mining. The soils, vegetation and radiological baseline data will be used as a guide in evaluating final reclamation. This section provides a general description of the proposed facility decommissioning and surface reclamation plans for the Moore Ranch Project. The following is a list of general decommissioning activities:

- Plug and abandon all wells.
- Determination of appropriate cleanup criteria for structures and soils.
- Radiological surveys and sampling of all facilities, process related equipment and materials on site to determine their degree of contamination and identify the potential for personnel exposure during decommissioning.
- Removal from the site of all contaminated equipment and materials to an approved licensed facility for disposal or reuse, or relocation to an operational portion of the mining operation.
- Decontamination of items to be released for unrestricted use to levels consistent with the requirements of NRC.
- Survey excavated areas for contamination and remove contaminated materials to a licensed disposal facility.

- Perform final site soil radiation surveys.
- Backfill and recontour all disturbed areas.
- Establish permanent revegetation on all disturbed areas.

Land use mitigation through site decommissioning is discussed in detail in Section 5.1 of this ER.

2.4.2.2 Mitigation of Groundwater Quality Impacts

The State of Wyoming and the NRC require restoration of affected groundwater in the mining zone following production activities. EMC will be required to return the groundwater in the mining zone to WDEQ class of use standards.

The goal of the groundwater restoration efforts will be to return the groundwater quality of the production zone, on a wellfield average, to the standard of pre-mining class of use or better using Best Practicable Technology (BPT) as defined in §35-11-103(f)(i) of the Wyoming Environmental Quality Act, 2006. The pre-mining class of use will be determined by the baseline water quality sampling program which is performed for each wellfield, as compared to the use categories defined by the WDEQ, Water Quality Division (WQD). Baseline, as defined for this project, shall be the mean of the pre-mining baseline data after outlier removals. Restoration shall be demonstrated in accordance with Chapter 11, Section 5(a)(ii) of the WDEQ, Land Quality Division Rules and Regulations.

The commercial groundwater restoration program consists of two stages, the restoration stage and the stability monitoring stage. The restoration stage typically consists of three phases:

1) Ground water transfer;
2) Ground water sweep;
3) Ground water treatment.

These phases are designed to optimize restoration equipment used in treating groundwater and to minimize the volume of groundwater consumed during the restoration stage. EMC will monitor the quality of groundwater in selected wells as needed during restoration to determine the efficiency of the operations and to determine if additional or alternate techniques are necessary. Online production wells used in restoration will be sampled for uranium concentration and for conductivity to determine restoration progress on a pattern-by-pattern basis.

Successful groundwater restoration has been demonstrated using the methods proposed by EMC. Therefore, long term impacts on groundwater quality are expected to be minimal. Groundwater quality mitigation measures are discussed in detail in Section 5.4 of this ER.

2.4.2.3 Financial Assurance

EMC will maintain surety instruments to cover the costs of reclamation including the costs of groundwater restoration, the decommissioning, dismantling and disposal of all buildings and other facilities, and the reclamation and revegetation of affected areas. Additionally, in accordance with NRC and WDEQ requirements, an updated Annual Surety Estimate Revision will be submitted to the NRC and WDEQ each year to adjust the surety instrument amount to reflect existing operations and those planned for construction or operation in the following year. After review and approval of the Annual Surety Estimate Revision by the NRC and WDEQ, EMC will revise the surety instrument to reflect the revised amount. The surety estimate prepared by EMC for this License Application is attached in Appendix D of the Technical Report.

2.4.3 Monitoring

2.4.3.1 Radiological Monitoring

EMC has completed a detailed characterization of the background radiological characteristics of the Moore Ranch Project area. The preoperational monitoring was designed to meet the requirements of NRC Regulatory Guide 4.14, *Radiological Effluent and Environmental Monitoring at Uranium Mills* and involved the following environmental sampling:

- Intensive (75 to 90 percent coverage) preoperational global positioning satellite (GPS) -based gamma survey of the areas proposed for the processing facility and wellfields;
- GPS-based gamma survey of the remainder of the proposed License area at a density of approximately 15 percent coverage.
- Surface and subsurface soil sampling;
- Sediment sampling;

- Ambient gamma and radon monitoring;
- Air particulate monitoring;
- Groundwater sampling;
- Surface water sampling; and
- Vegetation sampling.

In addition to the preoperational radiological characterization performed by EMC, Conoco performed site baseline monitoring in the late 1970's during licensing activities for a planned conventional mill as discussed in Section 2.2.2. EMC has provided this historical data and a comparison with the recent EMC data, where appropriate.

Based on the radiological effluents and exposure pathways, EMC has designed an operational radiological monitoring program that meets the guidance contained in Regulatory Guide 4.14. Radiological monitoring is discussed in detail in Section 6.1 of this ER.

2.4.3.1.1 Wellfield Operational Monitoring

During operation, the primary purpose of the wellfield monitoring program will be to detect and correct conditions that could lead to an excursion of lixiviant or detect such an excursion, should one occur. The techniques employed to achieve this objective include monitoring of production and injection rates and volumes, wellhead pressure, water levels and water quality.

- Monitoring of production (recovery) and injection rates and volumes will enable an accurate assessment of water balance for the wellfields. A bleed system will be employed that will result in less recovery solution being injected than the total volume of fluids (recovery solution and native groundwater) being extracted. An average bleed of 1% will be maintained during production. Maintenance of the bleed will cause an inflow of groundwater into the production area and prevent excursions.

- Wellhead pressure will be monitored at all injection wells. Pressure gauges will be installed at each injection wellhead or on the injection manifold and monitored at least daily. Wellhead pressure will be restricted to less than the formation hydraulic fracture pressure of 0.87 pounds per square inch (psi) per foot of well depth. Injection rates will be adjusted to maintain wellhead pressure below that level.

- Water level measurements will be routinely performed in the production zone and overlying aquifer. Sudden changes in water levels within the production zone may indicate that the wellfield flow system is out of balance. Flow rates would be adjusted to correct this situation. Increases in water levels in the overlying aquifer may be an indication of fluid migration from the production zone due to casing failure in a recovery, injection or monitor well. Isolation and shut down of individual wells can be used to determine the well causing the water level increases.

Mineralization is currently known to exists in the 70-sand, however the underlying 68 sand and the 70 sand coalesce in the area of wellfield 2 forming one aquifer (70/68 sand). In this area, underlying monitor wells will be completed in the 68 sand where a confining clay unit exists and deep trend wells will be utilized in the areas of coalescence to ensure vertical containment of mining solutions. No monitor wells are planned for the 60 sand (underlying the 70 sand) since the vertical monitoring will be conducted as described above.

The proposed groundwater monitoring program is described in Section 6.2 of this ER.

2.5 REASONABLE ALTERNATIVES

2.5.1 Process Alternatives

2.5.1.1 Lixiviant Chemistry

EMC proposes to use a sodium bicarbonate lixiviant that is an alkaline solution. Where the groundwater contains carbonate, an alkaline lixiviant will mobilize fewer hazardous elements from the ore body and will require less chemical addition than an acidic lixiviant. Also, test results at other projects indicate only limited success with acidic lixiviants, while the sodium bicarbonate has proven highly successful at commercial mining operations in the Powder River Basin to date. Alternate leach solutions include ammonium carbonate solutions and acidic leach solutions. These solutions have been used in solution mining programs in other locations. However, operators have experienced difficulty in restoring and stabilizing the aquifer. Therefore these solutions were excluded from consideration.

2.5.1.2 Groundwater Restoration

The success of the groundwater restoration techniques proposed by EMC has been shown at other ISR mining operations in the Powder River Basin. Groundwater sweep, permeate/reductant injection and groundwater treatment have successful restored the groundwater to pre-mining quality. No feasible alternative groundwater restoration method is currently available. The NRC and the WDEQ consider the method currently employed as the Best Practicable Technology (BPT) available.

2.5.1.3 Waste Management

Liquid wastes generated from production and restoration activities are generally managed at ISR facilities by solar evaporation ponds, deep well injection, and/or land application. The use of deep waste disposal well(s) is considered by EMC to be the best alternative to dispose of these types of wastes. The Moore Ranch deep well(s) will isolate liquid wastes generated by the project from any underground source of drinking water (USDW). These wells must be authorized by the State of Wyoming under a Class I UIC Permit. EMC has considered and rejected using solar evaporation ponds and land application as a disposal method at Moore Ranch due to required treatment, monitoring and reclamation costs, and the potential environmental impacts from a surface discharge.

All solid wastes will be properly managed. Non-contaminated solid waste will be disposed in an off site solid waste landfill permitted by the county in which it is located. Contaminated wastes will be shipped to a NRC-approved facility for disposal.

2.6 ALTERNATIVES CONSIDERED BUT ELIMINATED

As a part of the alternatives analysis conducted by EMC, several mining alternatives were considered. Due to the significant environmental impacts and cost associated with these alternative mining methods in relation to the Moore Ranch ore body, they were eliminated from further consideration.

2.6.1 Mining Alternatives

Underground and open pit mining represent the two currently available alternatives to solution mining for the uranium deposits in the project area. In the southern Powder River Basin uranium ore has been mined with open pits in the past. This activity occurred from 1970 to 1984 at the Exxon Highland facility and from the mid-1970s to 1986 at

Union Pacific Resources Bear Creek site, both located south of the Moore Ranch site. Ore was also mined with underground mining at the Exxon Highland site, in addition to the open pit method. The Moore Ranch project was originally investigated by Conoco in the late 1970's as an open pit mine. Neither of these methods is economically viable for producing the Moore Ranch reserves at this time.

From an environmental perspective, open pit mining or underground mining and the associated milling process involve higher risks to employees, the public, and the environment. Radiological exposure to the personnel in these processes is increased not only from the mining process but also from milling and the resultant mill tailings. The milling process generates a significant amount of waste relative to the amount of ore processed. Extensive mill tailings ponds are needed for the disposal of these wastes. The environmental impacts associated with open pit and underground mining are generally recognized as being considerably greater than those associated with in-situ recovery mining.

In a comparison of the overall impacts of ISR mining of uranium compared with conventional mining, an NRC evaluation concluded that environmental and socioeconomic advantages of in situ recovery include the following:

1. Significantly less surface area is disturbed than in surface mining, and the degree of disruption is much less.

2. No mill tailings are produced and the volume of solid wastes is reduced significantly. The gross quantity of solid wastes produced by ISR methods is generally less than 1% of that produced by conventional milling methods (more than 948 kg (2090 lb) of tailings usually result from processing each metric ton (2200 lb) of ore).

3. Because no ore and overburden stockpiles or tailings pile(s) are created and the crushing and grinding ore-processing operations are not needed, the air exposure problems caused by windblown dusts from these sources are eliminated.

4. The tailings produced by conventional mills contain essentially all of the uranium daughter products including radium-226 that are originally present in the ore. By comparison, less than 5% of the radium in an ore body is brought to the surface when ISR methods are used. Consequently, operating personnel are not exposed to the radionuclides present in and emanating from the ore and tailings and the potential for radiation exposure is significantly less than that associated with conventional mining and milling.

5. By removing the solid wastes from the site to a licensed waste disposal site and otherwise restricting them from contaminating the surface and subsurface environment, the entire mine site can be returned to unrestricted use within a relatively short time.

6. Solution mining results in significantly less water consumption than conventional mining and milling.

7. The socioeconomic advantages of ISR include:

    - The ability to mine a lower grade ore,
    - A lower capital investment,
    - Less risk to the miner,
    - Shorter lead time before production begins, and
    - Lower manpower requirements.

2.7 CUMULATIVE EFFECTS

2.7.1 Future Development

EMC has other potential resource areas identified in the Powder River Basin that may be developed as satellite facilities to the Moore Ranch Central Plant. Development of these facilities is dependent upon further site investigations by EMC and the future of the uranium market. If conditions warrant, EMC may submit license amendment requests to permit development of these additional resources. EMC currently projects that development of these areas would be primarily intended to maintain production allowed under the proposed license as reserves in the Moore Ranch site deplete.

2.8 COMPARISON OF THE PREDICTED ENVIRONMENTAL IMPACTS

Table 2.6-1 provides a summary of the environmental impacts for the no-action alternative (Section 2.1), the preferred alternative (Section 2.2), and the process alternatives (Section 2.5). The predicted impacts for the mining alternatives discussed in Section 2.6 are not included for comparison because these alternatives were rejected due to significant environmental and economic impacts. Environmental impacts are discussed in greater detail in Section 4.

Table 2.6-1: Comparison of Predicted Environmental Impacts

Impacts of Operation	No-Action Alternative	Preferred Alternative	Process Alternatives	
			Alternate Lixiviant Chemistry	Alternate Waste Management
Land Surface Impacts	None	Minimal temporary impacts in wellfield areas; Significant surface and subsurface disturbance confined to a portion of the Central Plant site.	Same as Preferred Alternative.	Same as Preferred Alternative. Potential additional impacts from land application of treated waste water.
Land Use Impacts	None	Loss of agricultural production (livestock grazing) in the impacted area for duration of project.	Same as Preferred Alternative.	Same as Preferred Alternative plus additional land use impact from installation of evaporation ponds and/or land application areas.
Transportation Impacts	None	Minimal impact on current traffic levels.	Same as Preferred Alternative.	Same as Preferred Alternative.
Geology and Soil Impacts	None	No geological impacts. Minimal temporary soil impacts in disturbance areas from wind and water erosion.	Same as Preferred Alternative.	Same as Preferred Alternative. Potential additional impacts to soils from land application of treated waste water.
Surface Water Impacts	None	None	None	None
Groundwater Impacts	None	Consumption of mining zone groundwater for control of mining solutions and restoration	Same as Preferred Alternative. Increased difficulty with groundwater restoration and stabilization.	Same as Preferred Alternative.

Table 2.6-1: Comparison of Predicted Environmental Impacts

Impacts of Operation	No-Action Alternative	Preferred Alternative	Process Alternatives	
			Alternate Lixiviant Chemistry	Alternate Waste Management
Ecological Impacts	None	No substantive impairment of ecological stability or diminishing of biological diversity.	Same as Preferred Alternative.	Same as Preferred Alternative.
Air Quality Impacts	None	Additional total dust emissions of 15.5 tons per year due to vehicle traffic on gravel roads.	Same as Preferred Alternative.	Same as Preferred Alternative.
Noise Impacts	None	Barely perceptible increase over background noise levels in the area.	Same as Preferred Alternative.	Same as Preferred Alternative.
Historic and Cultural Impacts	None	None	None	None
Visual/Scenic Impacts	None	Moderate impact; noticeable minor industrial component.	Same as Preferred Alternative.	Same as Preferred Alternative plus additional visual and scenic impacts installation of evaporation ponds and/or land application areas.
Socioeconomic Impacts	Loss of positive economic impact of $28.8M and 601 temporary and permanent jobs to Campbell County and the surrounding area	Annual direct economic impact of $28.8M and 601 temporary and permanent jobs to local area	Same as Preferred Alternative.	Same as Preferred Alternative.
Nonradiological Health Impacts	None	None	None	None

Table 2.6-1: Comparison of Predicted Environmental Impacts

Impacts of Operation	No-Action Alternative	Preferred Alternative	Process Alternatives	
			Alternate Lixiviant Chemistry	Alternate Waste Management
Radiological Health Impacts	None	Estimated maximum dose from radon gas released at Moore Ranch at the [project boundary is 0.8 mrem/yr or 0.8% of the public dose limit.	Same as Preferred Alternative.	Same as Preferred Alternative.
Waste Management Impacts	None	Generation of additional liquid and solid waste for proper disposal.	Same as Preferred Alternative. Mobilization of additional hazardous elements in lixiviant requiring disposal.	Generation of additional 11e.(2) byproduct material from decommissioning evaporation ponds.
Mineral Resource Recovery Impacts	Loss of a valuable domestic energy resource. EMC estimated reserves are under development but the current estimated recoverable resource is 5.8 million pounds with a current spot market value of $522 million (based on $90/lb).	Recovery and use of a domestic energy resource.	Same as Preferred Alternative.	Same as Preferred Alternative.

3.1 USES OF ADJACENT LANDS

The information in this section provides relevant data concerning the physical, ecological, and social characteristics of the proposed Moore Ranch License Area (License Area), and the surrounding environs for uranium in-situ mining.

This section examines the nature and extent of present and projected land and water use and trends in population or industrial patterns. Preliminary data were obtained from several sources followed by field studies to collect on-site data to check land uses.

NUREG-1569 recommends a review and discussion of land and water use in the License Area, and within a 2.0-mile radius (review area) surrounding the License Area. Land use within the review area is illustrated on Figure 3.1-1.

3.1.1 General Setting

The License Area is located in southwest Campbell County, Wyoming. Figure 3.1-1 shows land use in the general location of the proposed Moore Ranch License Area. Table 3.1-1 provides a description of the land use types depicted on Figure 3.1-1. State Highway 387 provides access to the project area from the Towns of Midwest and Edgerton to the west and the Town of Wright to the northeast of the License Area. Interstate 25 provides access to State Highway 387 from the south and west of the License Area.

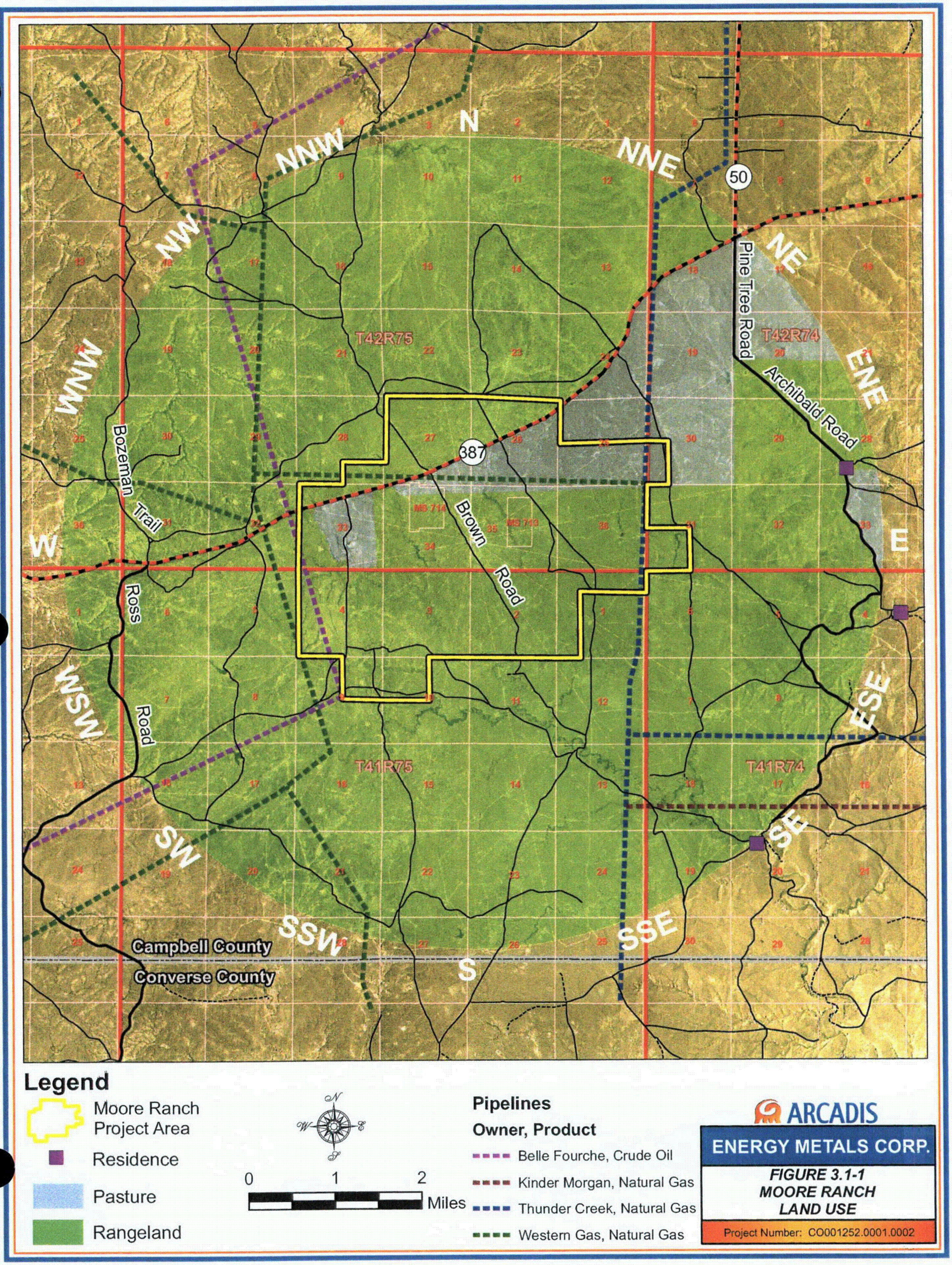
3.1.2 Land Use

Land use within the Moore Ranch License Area and a 2.0-mile review area around the License Area is illustrated on Figure 3.1-1. Table 3.1-1 describes the land use types depicted on Figure 3.1-1.

Table 3.1-2 presents land uses in 22 1/2° sectors centered on each of the 16 compass points. These sectors radiate out from the geographic center of the License Area. The total areas of the sectors vary because of the irregular site boundary. Rangeland is the primary land use within the License Area and within the surrounding 2.0-mile area. Oil and gas production facilities and infrastructure are located on rangeland land uses throughout the review area. The review area also contains pastureland to the west of the License Area. There are no other land uses that occur within the License Area and the surrounding 2.0-mile area.

Table 3.1-1 Land Use Definitions

Land Use	Definition
Pastureland (P)	Land used primarily for the long-term production of adapted, domesticated forage plants to be grazed by livestock or occasionally cut and cured for livestock feed.
Rangeland (R)	Land, roughly west of the 100th meridian, where the natural vegetation is predominantly grasses, grass-like plants, forbs, or shrubs; which is used wholly or partially for the grazing of livestock. This category includes wooded areas where grasses are established in clearings and beneath the overstory.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Pine Tree Road
T42R74
Archibald Road
T42R75
387
Brown Road
Bozeman Trail
Ross Road
T41R75
T41R74
Campbell County
Converse County
Legend
Moore Ranch Project Area
Residence
Pasture
Rangeland
0 1 2 Miles
Pipelines
Owner, Product
Belle Fourche, Crude Oil
Kinder Morgan, Natural Gas
Thunder Creek, Natural Gas
Western Gas, Natural Gas
ARCADIS
ENERGY METALS CORP.
FIGURE 3.1-1
MOORE RANCH
LAND USE
Project Number: CO001252.0001.0002

Table 3.1-2 Land Use of the Proposed Moore Ranch License Area and within a 2.0-Mile (3.3-km) Radius of the License Area Boundary

Compass Sector	Land Use within License Area (in acres)		Land Use within 2.0-Mile Buffer Surrounding License Area (in acres)		Total
	P	R/I	P	R/I	
NORTH	95.7	266.0	0.0	2,473.6	2,835.3
NNE	208.7	199.3	0.5	2,426.7	2,835.3
NE	287.9	89.6	2,083.7	374.1	2,835.3
ENE	328.5	347.9	805.7	1,353.2	2,835.3
EAST	0.0	678.7	218.4	1,938.3	2,835.3
ESE	0.0	368.6	0.0	2,466.6	2,835.3
SE	0.0	357.1	0.0	2,478.2	2,835.3
SSE	0.0	277.0	0.0	2,558.3	2,835.3
SOUTH	0.0	233.1	0.0	2,603.1	2,835.3
SSW	0.0	452.5	0.0	2,382.8	2,835.3
SW	0.0	618.4	0.0	2,216.8	2,835.3
WSW	11.6	599.8	0.0	2,223.9	2,835.3
WEST	198.9	316.7	0.0	2,319.6	2,835.3
WNW	93.5	345.8	0.0	2,396.0	2,835.3
NW	54.6	240.9	0.0	2,539.8	2,835.3
NNW	64.7	357.1	0.0	2,413.5	2,835.3
TOTAL	1,344.0	5,748.7	3,108.2	35,163.7	45,364.7

[1]22 $^{1}/_{2}$° sectors centered on each of the 16 compass points
[2]See Table 3.1-1 for an explanation of land use types: P = pastureland; R = rangeland.

Industrial and Mining land uses are sub-categories of the dominant rangeland land use within the License Area and the surrounding 2.0-mile review area. The Industrial and Mining land use sub-categories consists of ongoing oil and natural gas production facilities located throughout rangeland that is also used for grazing.

In 2006, an average of 50,000 livestock were reported for Campbell County (NASS 2007). Native grasslands are used for grazing within the License Area and the surrounding 2.0-mile area, and for cut hay in the northeast part of the review area. In 2005, cash receipts for livestock sales totaled $99.8 million in Campbell County. Table 3.1-3 shows the 2006 livestock inventory for Campbell County.

Table 3.1-3 2006 Livestock Inventory for Campbell County

Type of Livestock	Number	Percent of Total	Animal Units [a] Pounds (000s)	Animal Units [a] Percent
Beef Cows	49,950	39.0	49,950	47.3
Cows	50,000	39.1	50,000	47.4
Breeding Sheep & Lambs	28,000	21.9	5600	5.3
Total animals	127,950	100.0	105,550	100.0

Notes:
[a] Animal unit conversions:
1 cow = 1,000 lb.
1 sheep = 200 lb.
1 animal unit = 1,000 lb.
Source: USDA 2006.

Recreational lands also are present in Campbell, Natrona, Johnson, Converse, Niobrara, and Weston Counties within 50-miles of the License Area (Table 3.1-4). Recreational opportunities provided by federal and state lands in the county have become an increasingly important component of the local economy. The regional setting of the License Area provides broad, panoramic prairie landscapes, which provide a setting for a variety of outdoor recreational activities. Major attractions include the Thunder Basin National Grassland, several state historic sites, and the historic Bozeman Trail.

There is no recreational use of the License Area or the surrounding 2.0-mile area, as all of the land is privately owned; however, opportunities for developed and dispersed recreation exist on federal and state lands throughout the five counties that are within the 50-mile radius of the License Area. Developed recreational facilities, such as campgrounds, are generally limited to private lands in or near to larger communities within the 50-mile radius. These communities provide a variety of municipal and private recreational facilities including golf courses, rodeo grounds, ball parks, and swimming pools.

The region within the 50-mile radius of the License Area includes several special recreation management areas on public and private lands (Table 3.1-4). Limited developed recreation facilities are also located in special management areas on Bureau of Land Management (BLM)-administered public lands.

Table 3.1-4 Recreational Areas within 50-miles of the Moore Ranch License Area

Name of Recreational Facility	Managing Agency	Distance From Moore Ranch License Area (miles)
South Bighorn/Red Wall Back Country Byway	Wyoming Department of Transportation	41.0
Bozeman Trail	Various agencies	1.0
Thunder Basin National Grassland	US Forest Service	14.0
Pumpkin Buttes	BLM – Buffalo Field Office	10.0
Fort Reno Historic Site	Wyoming State Parks and Cultural Resources Department	27.0

Source: DeLorme Maps, 2003

Based on a site reconnaissance conducted in May 2007 and a 2006 aerial photo of the License Area, there are no occupied housing units in the License Area. Table 3.1-5 shows the distance to the nearest residence and to the nearest site boundary from the center of the site for each 22 1/2° sector centered on each of 16 compass points for the License Area. The nearest resident is 4.3 miles to the east of the License area as shown on Figure 3.1-1.

Table 3.1-5 Distance to Nearest Residence and Site Boundary from Center of Moore Ranch License Area for Each Compass Sector within the 2.0-Mile Radius

Compass Sector[1]	Nearest Residence (miles)	Nearest Site Boundary (feet/mile)
North	14.2	8,050/1.5
North-Northeast	8.5	8,700/1.6
Northeast	9.0	7,730/1.5
East-Northeast	15.0	9,180/1.7
East	4.3	10,620/2.0
East-Southeast	25.0	10,300/2.0
Southeast	5.0	7,407/1.4
South-Southeast	9.3	8,700/1.6
South	8.3	7,730/1.5
South-Southwest	9.0	8,050/1.5
Southwest	26.5	11,100/2.1
West-Southwest	8.5	11,300/2.1
West	8.0	10,600/2.0
West-Northwest	12.0	7,400/1.4
Northwest	10.2	8,050/1.5
North-Northwest	8.0	9,000/1.7

[1] $22^1/_2°$ sectors centered on each of the 16 compass points

3.1.2.1 Oil and Gas Development

The License Area is located within the Powder River Basin, which contains major deposits of coal bed methane (CBM) and other petroleum resources. Several oil and gas leases are located in the License Area. Both the License Area and the 2-mile buffer contain producing oil and gas wells, which are drilled to the Fort Union Formation. The administering agency for split estate minerals (private surface and federal subsurface minerals) is the Buffalo Field Office of the Bureau of Land Management. Table 3.1-6 lists the leases that are located partially or entirely within the License Area and the surrounding 2-mile buffer, and provides the 2006 annual gas and oil production total for each lease.

The Powder River Basin has been developed since the mid-1980's for the recovery of CBM. With advancements in technology, development and production of CBM has been increasing substantially since the mid-1990s. Development has been centered in all or parts of Campbell, Converse, Johnson, and Sheridan counties. The target coal zones are contained in the Fort Union formation.

CBM recovery methods, environmental impacts, existing CBM recovery facilities, and cumulative environmental impacts of existing CBM development and the Moore Ranch Project are discussed in detail in Section 4.14.

Table 3.1-6 Oil and Gas Leases in the Moore Ranch License Area[1]

License Area				2-Mile Buffer			
Lease	# Wells	2006 Oil Production (Bbls)	2006 Gas Production (Mcf)	Lease	# Wells	2006 Oil Production (Bbls)	2006 Gas Production (Mcf)
WYW 027112	13	8,893	65,668	WYW 031705	no records		
WYW 029019	no records			WYW 062365	no records		
WYW 0311966	3	5,476	41,107	WYW 111602	no records		
WYW 128092	no records			WYW 111608	3	0	99,673
WYW 144498	21	0	618,241	WYW 115668	2	0	53,819
WYW 145151	1	0	22,162	WYW 130597	8	0	344,605
				WYW 130607	no records		
				WYW 131506	no records		
				WYW 139088	2	0	88,989
				WYW 139089	2	0	75,692
				WYW 139669	11	0	293,362
				WYW 141222	11	0	470,219
				WYW 141654	2	0	78,846
				WYW 145150	13	0	469,267
				WYW 145571	19	0	318,859
				WYW 145572	3	0	5,693
				WYW 147285	1	0	36,885
				WYW 147289	10	0	368,745
				WYW 152618	no records		
				WYW 0258523	7	14,652	97,156
				WYW 0263740	1	667	11,128
				WYW 0266627	1	0	0
				WYW 0271123	2	3,458	4,419
				WYW 0271124	9	1,574	56,951
				WYW 0275169	13	1,270	275,612
				WYW 0297109	1	1,751	10,725
				WYW 0314361	17	3,899	12,853
				WYW 0525203	no records		

[1]Each lease is listed only once in the table; however, there is considerable overlap in the lease area boundaries within the License Area, the 2-mile buffer, and areas outside the License Area and the buffer.

Source: WYOGCC 20

3.1.2.2 Aesthetics

The Moore Ranch License Area is located on flat to rolling grasslands that are typical landscapes in the Powder River Basin. The License Area landscape is rural in character, with minor industrial development from oil and gas extraction activities. The landscape colors are dominated by tan, gold, and green vegetation and tan soils. As the License Area has been used historically for grazing and oil development, it is unlikely that any undisturbed area exists within the proposed License Area. Human influence is evident in existing grazing activities and facilities (stock tanks, fences), oil production facilities, natural gas production facilities, and infrastructures that support these activities. Oil and gas field infrastructure in the License Area and the surrounding 2.0-mile review area includes access roads, overhead electric distribution lines, and cleared rights-of-way for underground utilities, which are generally found along access roads.

3.1.2.3 Transportation and Utilities

The primary transportation route to the License Area from nearby communities is on State Highway 387, which connects the License Area to regional population and economic centers along Interstate 25 to the west. The City of Gillette is located approximately 50 miles northeast of the License Area on State Highway 59, which connects with State Highway 387 at Wright. Annual Average Daily Traffic counts along the 13.06-mile segment of State Highway 387 between the Campbell/Johnson county line and the State Highway 387 junction is 1,110 vehicles (WYDOT 2005). Several private access roads extend south from State Highway 387 to access existing agricultural, as well as oil and gas facilities in the License Area. None of the existing roads in the License Area provide access to residences or other public destinations.

As shown on Figure 4.14-1, the project area contains a significant amount of overhead power lines associated with CBM development. As a result, electrical power will be available for Moore Ranch operations without requiring large-scale installation of new electrical transmission lines. Some large scale oil and gas pipelines exist just west of the proposed project boundaries as shown in Figure 3.1-1. The Moore Ranch Project will not have an impact on these lines due to the distance from the project. Smaller pipelines and utility lines exist in the project area as a result of CBM operations. Interaction with this existing infrastructure is discussed in further detail in Section 4.14.

3.1.2.4 Fuel Cycle Facilities

The United States Nuclear Regulatory Commission website (NRC 2007) provides the locations of all source material facilities in the United States, including fuel cycle facilities and uranium mills. The website was reviewed to identify the location of fuel cycle facilities and uranium mills within 50 miles (80-km) of the proposed Moore Ranch License Area. No fuel cycle facilities were located within 50 miles of the License Area. The nearest facility is the AREVA NP, Inc. uranium fuel fabrication facility, located in Richland, Washington (U.S. NRC 2007).

Several Source Material Licenses for in-situ uranium projects occur within a fifty mile radius of the Moore Ranch Project as shown on Figure 3.1-2. These sites are listed below:

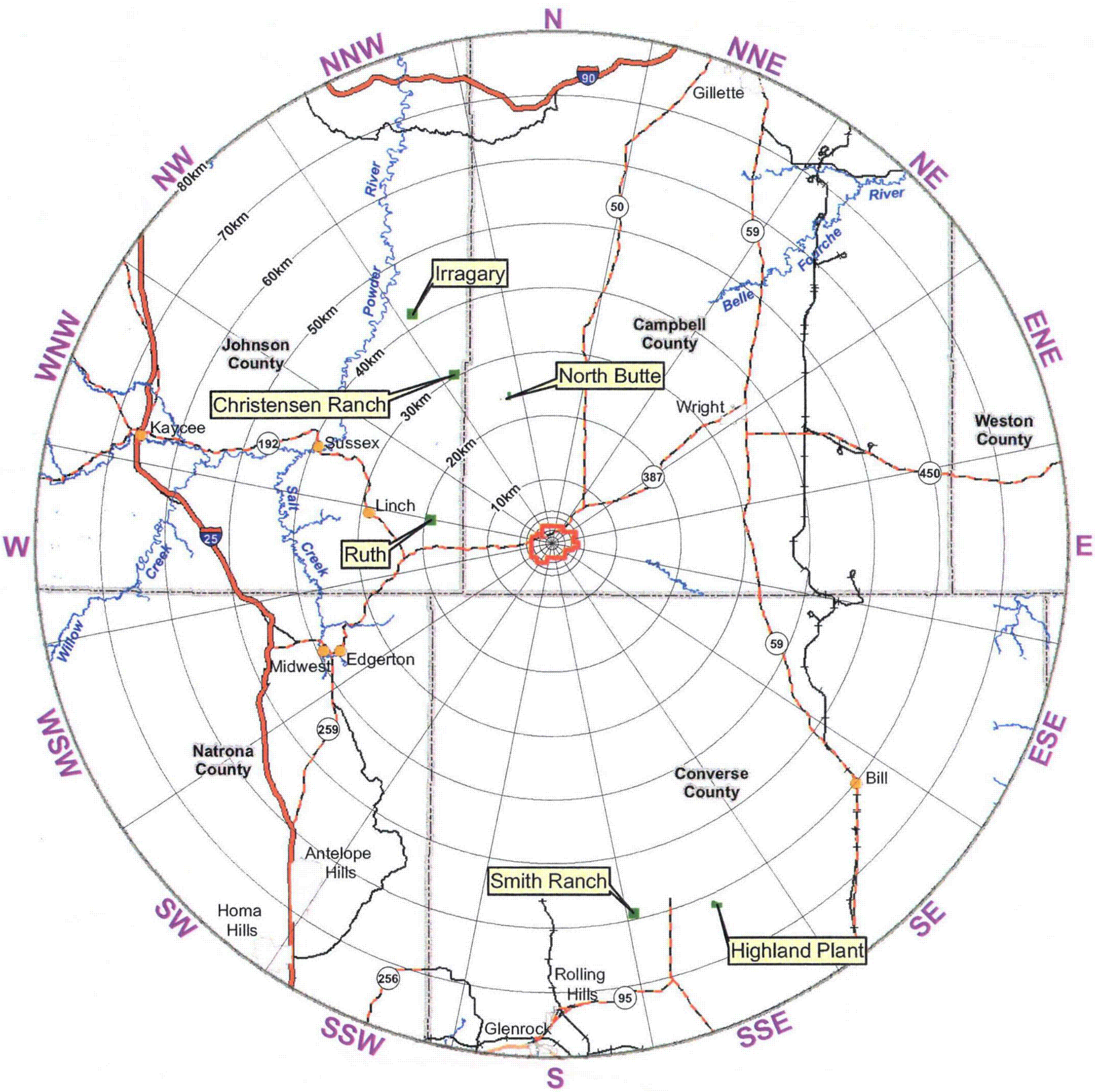
- Smith Ranch-Highland Uranium Project (SUA-1548, Power Resources, Inc.)- The Smith Ranch plant is located in T36N, R74W, Section 36 (59 km SSE of the proposed Moore Ranch Project) and is operational. The Highland plant is located in T36N, R72W, Section 29 (62 km SSE of the proposed Moore Ranch Project) and is currently on standby status. Three satellite ion exchange facilities are in operation and two more are planned for construction in the Smith Ranch-Highland license area.

- Christensen Ranch-Irigaray (SUA-1341 Cogema Mining Co.) - The Christensen Ranch site is located in Johnson County, T44N, R76W, Section 7 (30 km NNW of the proposed Moore Ranch Project) and the Irigaray satellite is located in Johnson County, T45N, R77W, Section 9 (42 km NNW of the proposed Moore Ranch Project). Both of these sites are on standby status.

- North Butte Project (SUA-1548, Power Resources Inc.) - The North Butte Project is located in Campbell County, T44N, R76W, Section 24 (25 km NNW of the proposed Moore Ranch Project). This is a satellite project for the Smith Ranch-Highland project and is not constructed or in operation.

- Ruth Project (SUA-1548, Power Resources, Inc.)- The Ruth Project is located in Johnson County, T42N, R77W, Section 23 (20 km W/WNW of the proposed Moore Ranch Project). This is a satellite project for the Smith Ranch-Highland project and is not constructed or in operation.

The nearest operational in-situ plant is the Smith Ranch facility, which is the only currently producing facility in Wyoming. The facility is in Converse County about 36 miles south-southeast of the Moore Ranch License Area (U.S. NRC 2007, Wise Uranium 2007). The Christensen Ranch site, located about 17 miles northwest of the License Area, has submitted an application in 2007 to restart the in-situ recovery operation.



Legend

Moore Ranch Project Area

Uranium Source Materials Locations

0 5 10 20 Miles

ARCADIS

ENERGY METALS CORP.

FIGURE 3.1-2
MOORE RANCH OJECT
URANIUM SOURCE MATERIALS PROJECTS
WITHIN 80 KILOMETERS

Project Number: CO001252.0001.0002

3.2 TRANSPORTATION

3.2.1 Highways

The primary transportation route to the proposed Moore Ranch license area from nearby communities is on State Highway 387, which connects the license area to regional population and economic centers along Interstate 25 to the west and State Highway 59 to the east. The City of Gillette is located approximately 50 miles northeast of the license area on State Highways 50 and 59. Interstate 25 connects to State Highway 387 via State Highway 192 from the Town of Kaycee and via State Highway 259 at the Town of Midwest. State Highway 50 connects with State Highway 387 approximately 4 miles east of the license area and State Highway 59 connects with State Highway 387 at the town of Wright. Annual Average Daily Traffic counts along the 13.06-mile segment of State Highway 387 between the Campbell/Johnson county line and the State Highway 387 junction is 1,110 vehicles (WYDOT 2005). Several private access roads extend south from State Highway 59 to access existing agricultural, as well as oil and gas facilities in the Permit Area. None of the existing roads in the license area provide access to residences or other public destinations. Figure 1.2-1 and 3.1-2 show the locations of highway access to the Moore Ranch Project site.

3.2.2 Railroads

The Burlington Northern Santa Fe (BNSF) Railroad runs in a north-south direction approximately 25 miles east and 50 miles south of the proposed license area. This rail line primarily accommodates shipping of coal from the coal mining operations in eastern Wyoming. It is not anticipated that these railroads will be utilized as a transportation option for any aspect of Moore Ranch operations.

3.3 GEOLOGY, SOILS, AND SEISMOLOGY

To aid in the review of Sections 3.3.1 through 3.3.4 all tables and figures were placed in Addendum 3.3-A.

3.3.1 Regional Geology

The Powder River Basin extends over much of northeastern Wyoming and southeastern Montana, and consists of a large north-northwest trending asymmetric syncline. The basement axis lies along the western edge of the basin, and the present surface axis lies to the east of the basement axis. The basin is bounded by the Big Horn Mountains to the west, the Black Hills to the east, and the Hartville Uplift and Laramie Mountains to the south.

The Powder River Basin is filled with marine, non-marine, and continental sediments ranging in age from early Paleozoic through Cenozoic. Sediments reach a maximum thickness of about 18,000 feet in the deepest parts of the basin, and probably range from 16-17,000 feet thick in the permit area, due to its close proximity to the deepest part of the basin.

The southern part of the basin contains Lance, Fort Union, Wasatch and White River formation outcrops. The Upper Cretaceous Lance formation is the oldest of these units, and consists of 1,000 to 3,000 feet of thinly-bedded, brown to gray sands and shales. The upper part contains minor, dark carbonaceous shales and thin coal seams, indicating a changing depositional environment over time, which was in this case the gradual regression of a shallow inland sea.

The Paleocene Fort Union formation conformably overlies the Lance and consists of continental and shallow non-marine deposits in two members. The lower member consists of fine-grained, clay-rich, drab to pink sandstone, with minor claystone and coal. The sandstones were deposited as alluvial fans and braided stream channels during erosion of the uplifted Black Hills, Bighorn, and Laramie Mountains. The upper member consists of shale, clayey sandstone, fine-to-coarse-grained sandstone, and some extensive sub bituminous lignite beds. The total thickness of the Fort Union formation varies between 2,000 and 3,500 feet (Conoco 1980; Sharp et al., 1964).

The early Eocene Wasatch formation unconformably overlies the Fort Union formation around the margins of the basin. However, the two formations are conformable and gradational towards the basin center and permit area. The relative amount of coarse, permeable clastics increases near the top of Fort Union, and the overlying Wasatch formation contains numerous beds of sandstone which are sometimes correlatable over wide areas. Except in isolated areas of the Powder River Basin, the Wasatch-Fort Union contact is arbitrarily set at the top of the thicker coals or of some thick sequence of clays and silts. The top of the Roland coal is probably the boundary in the project area.

The Wasatch formation crops out at the surface in the permit area. The Wasatch is similar to the Fort Union, but also contains thick lenses of coarse, crossbedded, arkosic sands deposited in a high-energy fluvial environment. These sandstone horizons are the host rocks for several uranium deposits in the southern Powder River Basin. Within the permit area, mineralization is found in a 50-100 foot thick sandstone lens which extends over an area of several townships. On a regional scale, mineralization is localized and controlled by facies changes within this sandstone, including thinning of the sandstone unit, decrease in grain size, and increase in clay and organic material content. The Wasatch formation reaches a maximum thickness of about 1,600 feet (1,100 to 1,300 feet in the permit area) and dips northwestward from one degree to two and a half degrees in the southern part of the Powder River Basin (Conoco 1980; Sharp et al., 1964).

The Oligocene White River formation overlies the Wasatch formation and has been removed from most of the basin by erosion. Remnants of this unit crop out on the Pumpkin Buttes, located approximately eight miles to the north of the permit area, and at the extreme southern edge of the Basin (about 60 miles to the south). The White River consists of clayey sandstone, claystone, a boulder conglomerate and tuffaceous sediments which may be the primary source rock for uranium in the Moore Ranch area and the southern part of the basin as a whole (Conoco 1980; Sharp et al., 1964). The youngest sediments consist of Quaternary alluvial sands and gravels locally present in larger valleys. Quaternary eolian sands can also be found locally.

The Teapot and Parkman sandstones are approximately 8,500 to 9,000 feet below land surface in this area, and are the next hydrologically significant geologic units below the Fort Union sands. The water quality of three well samples from the Parkman sandstone in Johnson County (see Whitcomb, Cummings and McCullough, 1966) near the outcrop of this formation contained total dissolved solids from 1360 to 3060 mg/l. Water quality is normally poorer at greater distances from its outcrop area, making the use of these aquifers questionable in this area.

The Madison limestone and Tensleep sandstone are approximately 15,000 feet below the land surface and would produce the largest discharge rates from wells in this area. The Madison is known to flow at several thousand gallons per minute to the Midwest area (see Crist and Lowry, 1972), and the flows from the Tensleep sandstone in this area are in the hundreds of gpm. However, the water quality of the Madison and Tensleep in the Powder River Basin is poor. Therefore, even though the Madison and Tensleep aquifers produce large quantities of water, the quality would probably make those aquifers unusable. Only the Roland coal and the Wasatch formation will be discussed further, because the lower units will not be influenced by this project.

3.3.2 Site Geology

The site is situated in the southwestern part of the Powder River Basin approximately 12 miles east-northeast of the Tertiary Wasatch-Fort Union formation contact. The Wasatch formation, which is the surface geologic unit in this area, is part of the thick Powder River sedimentary series and consists of interbedded sandstones, siltstones, claystones and coals. (Seeland, 1976) found that the Wasatch sandstones were deposited in a fluvial paleo drainage system which flowed generally northward. These channel deposits are the host rocks for many uranium ore deposits.

The Wasatch sandstones are very light gray to buff, semi-consolidated and well-sorted, with grain sizes in individual beds ranging from very fine to very coarse. Graded bedding is common and individual beds vary in thickness from a few inches to several feet. The finer-grained rocks range from highly consolidated, medium gray siltstones to dark gray carbonaceous claystone. The top of the Roland is approximately 1,100 feet deep in this area. The dip of the top of the Roland coal is to the west-northwest at an average of one degree.

Conoco exploration nomenclature designated most sands above the Roland coal with decreasing numbers with depth. Figure 3.3-1 depicts the sand units relevant to this project. Cross sections from exploration logs were developed for the area to evaluate the aerial distribution of these sands. Figure 3.3-2 shows the locations of the five cross sections included in Figures 3.3-3 through Figure 3.3-7 (A-A' through E-E' respectively). A pervasive lignite bed just above the ore sand was used as a datum for the cross sections, since the available elevation data on historic logs is questionable.

The 40 and 50 sands are separated by 5 to 40 feet of shale or mudstone and extend aerially across the project area. The approximate thicknesses of the 40 and 50 sands are 80 and 90 feet, respectively. These two sands contain some coarse material in most areas and are considered significant aquifers. The 60 sand is approximately 100 feet thick and is continuous throughout the area. It is separated from the 50 sand by about 80 feet of shale or mudstone with some interspersed sandstone lenses. The 40, 50, and 60 sands are shown in cross sections C-C' and E-E'. They all contain trace amounts of mineralization in various locations within the project area, however these deposits are not considered economic at this time.

The 68 sand is separated from the 60 sand by 5 to 25 feet of shale or mudstone. It is the first sand below the 70 sand, which contains the economic ore deposits in the area, and is therefore referred to as the underlying 68 sand. Figure 3.3-8 is an isopach map of the underlying 68 sand. The sand ranges from 40 to 100 feet thick within the project area.

The 70 sand is the proposed ore production sand. It is laterally extensive and ranges from 40 to 120 feet thick. The dip is generally less than one degree toward the northwest. A one to 3 foot thick lignite exists normally a few feet above the top of the 70 sand and has been labeled by

Conoco as the E coal. The average dip of the E coal is one-half of one degree toward the northwest. The average depth to the ore zone is 180 feet (Conoco 1980; Sharp et al., 1964).

Figure 3.3-9 is an isopach map of the production 70 sand. In the vicinity of monitor well UMW-2 the sand thickens and coalesces with the underlying 68 sand. An isopach map of the underlying shale (Figure 3.3-10) illustrates the disappearance of this shale in a small area around UMW-2 and a slightly larger area just to the northeast of UMW-2 (see also cross sections A-A' and E-E'). The coalescence of the 68 and 70 sands is discussed in further detail in Section 3.4. Figures 3.3-11 and 3.3-12 are isopach maps of the overlying shale and the overlying 72 sand, respectively. The overlying shale ranges from a few feet to 160 feet thick (where the 72 sand pinches out), and typically includes the E coal. The overlying 72 sand is anywhere from 0 to 100 feet thick. The sand pinch-out on the west side of the project area can also be seen on cross sections A-A' and D-D'.

3.3.3 Mineralogy of the Uranium Ore

The ore-bearing unit (70 sand) is an arkosic sandstone with calcite and clays as the dominant cementing material. The mean size of the particles is about 0.3 millimeters and the slime content (-325 mesh) is 3 to 6 percent. The dominant clay is montmorillonite, approximately 50 percent, and the other clays, illite and kaolinite, each comprise about 25 percent of the total clay content. There are also trace amounts of chlorite present (Conoco, 1982).

The uranium is associated with either calcite or clay cement. Occasionally, the uranium is associated with woody lignite fragments. Very little crystalline uranium mineral can be identified except for the occasional presence of uranite. Heavy minerals include pyrite, magnetite, ilmenite, and garnet (almandine) (Conoco, 1982).

3.3.4 Drill Holes

The Moore Ranch Uranium Project was extensively explored from the 1970s through the mid-1980s with the principle exploratory work and drilling completed by Conoco Minerals Corporation. Approximately 2,700 rotary drill holes and approximately 130 core holes were completed by Conoco. The drilling included the delineation of 3 areas of mineralization as planned open pit mining operations with drilling on 50-foot centers. Mineral resource estimates are based on radiometric equivalent uranium grade as measured by the geophysical logs and verified by core drilling and chemical analysis. Drill holes completed by Conoco were reported plugged in accordance with Wyoming Statute WS 35-11-401 in effect at the time. According to WDEQ-LQD District III personnel, several holes required additional abandonment work, which was completed by Conoco.

EMC conducted verification drilling in late 2006 totaling 157 holes and 20 monitor wells. The drilling was conducted under WDEQ-LQD Drilling Notification 342DN and all drill holes were plugged in accordance with Wyoming Statute WS35-11-401 as documented.

Table 3.3-1 lists all drill holes known to EMC in the project area and Figure 3.3-13 is a map showing these known drill holes.

3.3.5 Soils

The Energy Metals Moore Ranch Unit was evaluated by BKS Environmental Associates, Inc., Gillette, Wyoming in 2007. The tables for this section begin on page 3.3-11.

The following NRCS soil series have been renamed: Absted loam to Arvada (thick surface) loam, Fort Collins loam to Forkwood loam, Olney sandy loam to Hiland sandy loam, Tassel sandy loam to Taluce sandy loam, Terry sandy loam to Terro sandy loam, Stoneham loam to Cambria loam, and Thedalund loam to Theedle loam. A total of 7,104.1 acres were included in the final soil mapping of the Moore Ranch Unit. Soils mapped by BKS Environmental Associates, Inc. are illustrated on Figure 3.3-14 (Addendum 3.3-B).

Stripping depths for the Moore Ranch Unit were evaluated during mapping and sampling. Soil depths within a given mapping unit will vary based on any combination of the five primary soil forming factors, i.e., climate including effective precipitation, organisms, relief or topography, parent material, and time. Subtle differences in any one of the previously mentioned factors will impact development between series and within series designation but may not be as noticeable as when topography is a major factor. The proposed topsoil salvage depths for the Moore Ranch Unit are based on laboratory data of the samples found within the borders of the area, as well as field observations and knowledge of the soils in Southern Campbell County, Wyoming.

Soils in the Moore Ranch Unit are typical for semi-arid grasslands and shrublands in the Western United States. Parent material included colluvium, residuum, and alluvium. Most soils are classified taxonomically as Ustic Paleargids, Ustic Haplargids, Ustic Torriorthents, and Ustic Haplocambids.

Most soils have some suitable topsoil. The primary limiting chemical factor within the Moore Ranch Unit is likely Selenium. The primary limiting physical factor is texture.

Large scale soil surveys had been previously conducted, by the U.S. Department of Agriculture (USDA), Natural Resource Conservation Service (NRCS) in 1972 and 1991. The major objective of the 2007 assessment was to define the existing topsoil resource within the Moore Ranch Unit and determine the extent, availability, and suitability of soils material for use in reclamation. The mapping and reporting for the Moore Ranch Unit incorporated map unit information from the previous NRCS soil surveys. Soil sampling needs were determined from WDEQ Guideline 1 (August 1994 Revision).

Refer to Addendum 3.3-B for the Soils Map and Soil Mapping Unit Descriptions. Refer to Addendum 3.3-C for the Soil Series Descriptions. Refer to Addendum 3.3-D for the Original Laboratory Data Sheets. Refer to Addendum 3.3-E for the Prime Farmland Designation.

3.3.5.1 Methodology

Review of Existing Literature

The soils in this portion of Campbell County were studied and mapped to an Order 3 scale by the USDA, NRCS in 1972 and 1991. Information in Southern Campbell County is available electronically as well as hard copy. The NRCS has also centralized dissemination of typical soil series descriptions; information is available on the internet at www.nrcs.usda.gov.

Project Participants

BKS performed the 2007 soil survey field work and compiled the resulting report. All soil analysis was handled by Energy Labs. Samples were taken to Energy Labs in Gillette for shipment to Casper, Wyoming and ultimate analysis.

Soil Survey

Construction of the project area soil map was completed according to techniques and procedures of the National Cooperative Soil Survey. Guideline No. 1 (original November, 1984 and updated August, 1994) of the Wyoming Department of Environmental Quality, Land Quality Division (WDEQ-LQD) was followed during all phases of the work.

The following NRCS soil series have been renamed: Absted loam to Arvada (thick surface) loam, Fort Collins loam to Forkwood loam, Olney sandy loam to Hiland sandy loam, Tassel sandy loam to Taluce sandy loam, Terry sandy loam to Terro sandy loam, Stoneham loam to Cambria loam, and Thedalund loam to Theedle loam. A total of 7,104.1 acres were included in the final soil mapping of the Moore Ranch Unit.

Refer to Table 3.3-2 for soil mapping unit designations and associated acreage within the Moore Ranch Unit. Table 3.3-2 also describes the soil map units in terms of actual map designations and slope percentages.

Field Sampling

Soil series were sampled to reflect recommended sample numbers in WDEQ Guideline 1 (August 1994 Revision) based on preliminary mapping acreage identified at that time.

Series were sampled and described by coring with a mechanical auger, i.e., truck-mounted Giddings. The physical and chemical nature of each horizon within the sampled profile was described and recorded in the field. Although numerous holes were augured for series and map unit verification, only the field locations of profiles selected for laboratory analysis are plotted on the soils map included with this report. Sampled soil material was placed in clean, labeled, polyethylene plastic bags and kept cool to limit chemical changes. Samples were kept out of direct sunlight and transported to Energy Labs for analysis. A total of 20 sites on the Moore Ranch Unit were sampled for analysis; all had corresponding soil profile descriptions written. Refer to Table 3.3-3 Soils Series Sample Summary and Table 3.3-4 Soil Sample Locations.

Laboratory Analysis

Samples were individually placed into lined aluminum pans to air dry. Coarse fragments were measured with a 10 mesh screen prior to grinding; the entire sample was then hand ground to pass 10 mesh. An approximate 20 ounce subsample was obtained through splitting with a series of riffle splitters and subsequently analyzed. A second subsample was maintained in storage at Energy Labs. Approximately 10 percent of the samples are run for duplicate analysis. Actual laboratory analysis follows the methodology outlined in WDEQ-LQD Guideline 1 (August 1994 Revision). In general, samples were analyzed within 45 days of receipt of the samples at the laboratory. All analytical data is presented in Addendum 3.3-D, Original Laboratory Data Sheets.

3.3.5.2 Results and Discussion

Soil Survey - General

General topography of the area includes rolling hills and ridges, as well as drainages. The soils occurring on the Energy Metals Moore Ranch Unit were generally fine textured throughout with patches of sandy loam on upland areas and fine textured soils occurring near or in drainages. The project area contained deep soils on lower toe slopes and flat areas near drainages with shallow and moderately deep soils located on upland ridges and shoulder slopes.

Soil Mapping Unit Interpretation

The primary purpose of the 2007 fieldwork was to characterize the soils within the proposed project area in terms of topsoil salvage depths and related physical and chemical properties. The total number of samples per series was established in line with WDEQ Guideline 1 (August 1994 Revision) recommendations based on estimated acreage of soil series known within the Moore Ranch Unit Study Area which includes the ore body and proposed facilities. Refer to Addendum 3.3-B and 3.3-C for soil mapping unit descriptions and soil series descriptions, respectively.

Analytical Results

Analyzed parameters, as defined in WDEQ Guideline 1 (August 1994 Revision), are in Addendum 3.3-D, Original Laboratory Data Sheets. Laboratory soil texture analysis did not include percent fine sands. Field observations of fine sands within individual pedestals as well as sample site topographic position were used in conjunction with laboratory analytical results to determine series designation.

Evaluation of Soil Suitability as a Plant Growth Medium

Approximate salvage depths of each map unit series is presented in Table 3.3-6 and ranged from .8 to 5 feet. Within the Moore Ranch Project area, suitability of soil as a plant growth medium is generally affected by physical factors such as texture. Chemical limiting factors included selenium (Se), saturation percentage and, in one case, SAR. Marginal material, according to WDEQ Guideline 1, was found in 11 of the 20 profiles. No unsuitable material, according to WDEQ Guideline 1, was found in any of the profiles. Marginal or unsuitable parameter information for sampled profiles is identified in Table 3.3-5. Based on laboratory analysis and field observations marginal material parameters primarily consisted of texture and selenium (Se).

Topsoil Volume Calculations

Based on the 2006 fieldwork with associated field observations and subsequent chemical analysis, recommended topsoil average salvage depths over the proposed project boundary were determined to be 3.6 feet. Refer to Table 3.3-6, Approximate Soil Salvage Depths.

In accordance with WDEQ Guideline 4, the A (and E) horizons are to be salvaged from secondary access roads. As shown in Addendum 3.3-C, the typical A soil horizons for the mapping units contained on the Moore Ranch project range from 0-2 to 0-5 inches with a typical rang of 0-3 inches (no E horizons are shown). Since the primary access road is already constructed, only secondary roads to access wellfield facilities will be constructed for the Moore Ranch Project. It is estimated that approximately 2 miles of secondary roads will be constructed (typical width is 15 feet including borrow ditches) totaling approximately 2 acres. Assuming the typical 3 inches of topsoil is stripped, the approximate volume that will be salvaged for road construction 0.5 acre-ft.

The fenced controlled area containing the central plant, office building, shop, warehouse, parking lots, and other facilities is approximately 11 acres. In accordance with WDEQ Guideline 4, suitable topsoil shall be salvaged from permanent or long-term facilities areas. Assuming all 11 acres will be stripped for construction of these facilities, approximately 39.6 acre-ft of topsoil (at the average depth of 3.6 feet) may be salvaged and stockpiled (some portions of the 11-acre area may not contain facilities that require salvaging of topsoil, therefore the volume estimate is considered conservative). All long-term topsoil stockpiles will be constructed and maintained in accordance with WDEQ-LQD Rules and Regulations, Chapter 2.

Topsoil is not stripped from wellfield areas, and no other large structures such as tailings disposal ponds, evaporation ponds, or overburden piles will be constructed at the site that would require salvage of topsoil.

Soil Erosion Properties and Impacts

Based on the soil mapping unit descriptions, the hazard for wind and water erosion within the Moore Ranch Unit varies from slight to severe. The potential for wind and water erosion is mainly a factor of surface characteristics of the soil, including texture and organic matter content. Given the fine-loamy and sandy texture of the surface horizons throughout the majority of the Moore Ranch Unit, the soils are more susceptible to erosion from wind than water. See Table 3.3-7 for a summary of wind and water erosion hazards within the Moore Ranch Unit.

The 11 acre fenced controlled area is underlain by soils with a slight potential for water erosion and a severe potential for wind erosion. All topsoil will be stripped, stockpiled and maintained in accordance with WDEQ-LQD rules and regulations, the surface will be graded, and stormwater will be routed. These measures will help reduce the effect of construction on soil erosion.

The soils underlying the proposed wellfields are at a moderate to severe risk of erosion from both wind and water. Though no topsoil will be stripped from the wellfields, construction may result in an increase in the erosion hazard from both wind and water due to the removal of vegetation and the physical disturbance from heavy equipment. All areas are reseeded as soon as possible to keep the duration of bare soil to a minimum. Reseeding will help mitigate the increased erosion potential from the construction disturbance.

Prime Farmland Assessment

No prime farmland was indicated within the Moore Ranch Unit based on a reconnaissance survey by the NRCS. Refer to Addendum 3.3-E, Prime Farmland Designation, for the NRCS letter of negative determination.

Table 3.3-2 Soil Mapping Unit Acreages for the Moore Ranch Unit				
Map Symbol	**Map Unit Description**	**Permit Acreage**	**Study Area Acreage**	**% Total Study Area**
110	Bidman loam, loamy substratum, 0 to 6 percent slopes	1.81		
144	Forkwood loam, 0 to 6 percent slopes	349.08	25.58	2.56
156	Hiland fine sandy loam, 0 to 6 percent slopes	297.58	156.14	15.63
226	Ulm loam, 0 to 6 percent slopes	211.59	39.87	3.99
227	Ulm clay loam, 0 to 6 percent slopes	26.69		
235	Vonalee fine sandy loam, 0 to 10 percent slopes	216.75	30.08	3.01
111-1	Bidman loam, 0 to 6 percent slopes	108.97	31.5	3.15
111-2	Parmleed loam, 0 to 6 percent slopes	138.37		
112-1	Bidman loam, 6 to 15 percent slopes	40.82		
112-2	Parmleed loam, 6 to 15 percent slopes	170.57		
116-1	Cambria loam, 0 to 6 percent slopes	61.82		
116-2	Kishona loam, 0 to 6 percent slopes	193.13	8.79	0.88
116-3	Zigweid loam, 0 to 6 percent slopes	74.21	23.18	2.32
117-1	Cambria loam, 6 to 15 percent slopes	71.51		
117-2	Kishona loam, 6 to 20 percent slopes	13.22		
122-1	Cushman loam, 6 to 15 percent slopes	730.43	187.07	18.73
124-2	Shingle loam, 3 to 30 percent slopes	272.28	68.60	6.87
127-2	Theedle loam, 0 to 30 percent slopes	842.27	74.46	7.46
140-1	Embry sandy loam, 3 to 20 percent slopes	41.15		
146-2	Cushman loam, 0 to 6 percent slopes	493.61	133.08	13.33
147-1	Forkwood loam, 6 to 15 percent slopes	90.39		
153-1	Haverdad clay loam, 0 to 6 percent slopes	141.42		
153-2	Kishona clay loam, 0 to 6 percent slopes	163.66		
157-2	Bowbac fine sandy loam, 0 to 6 percent slopes	211.56	62.25	6.23
158-1	Hiland fine sandy loam, 6 to 15 percent slopes	825.73	97.56	9.77
158-2	Bowbac fine sandy loam, 6 to 15 percent slopes	493.10	35.33	3.54
170-2	Tullock loamy sand, 6 to 30 percent slopes	8.49		
171-1	Keeline, dry complex, 3 to 30 percent slopes	106.75	19.52	1.95
194-1	Pugsley sandy loams, 6 to 15 percent slopes	53.65		
194-2	Decolney sandy loams, 6 to 15 percent slopes	12.99		

Table 3.3-2 Soil Mapping Unit Acreages for the Moore Ranch Unit				
205-1	Samday clay loam, 3 to 15 percent slopes	14.03		
213-1	Terro sandy loam, 6 to 30 percent slopes	142.49		
216-2	Kishona loam, 6 to 30 percent slopes	261.53		
221-1	Turnercrest fine sandy loam, 6 to 30 percent slopes	168.96		
221-3	Taluce fine sandy loam, 6 to 30 percent slopes	22.55	5.66	0.57
228-2	Renohill clay loam, 0 to 6 percent slopes	5.29		
236-2	Terro fine sandy loam, 2 to 10 percent slopes	25.65		
Total		**7,104.1**	**998.67**	**100.00**

Table 3.3-3. Soil Series Sample Summary for the Moore Ranch Unit Study Area[1]

Soil Series	Number of Profiles to be Sampled for Chemical Analysis
Forkwood	1
Hiland	3
Ulm	1
Ulm clay	0
Vonalee	1
Bidman	1
Parmleed	0
Cambria	0
Kishona	1
Zigweid	1
Cushman	3
Shingle	2
Theedle	2
Embry	0
Haverdad	0
Bowbac	2
Tullock	0
Keeline	1
Renohill	0
Pugsley	0
Decolney	0
Samday (Samsil)	0
Terro	0
Taluce	1
Turnercrest	0
Total	**20**

[1]Based on the proposed disturbed area as defined by initial estimates of the ore body, facilities and major roads.

Table 3.3-4. Soil Sample Locations for the Moore Ranch Unit Study Area

Soil Sample Number	Map Unit Designation	Soils Series
14-1	156 Hiland fine sandy loam, 0 to 6 percent slopes	Hiland
19-1	156 Hiland fine sandy loam, 0 to 6 percent slopes	Hiland
33-1	171-1 Keeline, dry complex	Keeline
36-1	122-1 Cushman loam, 6 to 15 percent slopes	Cushman
37-1	146-2 Cushman loam, 0 to 6 percent slopes	Cushman
80-1	158-2 Bowbac fine sandy loam, 6 to 15 percent slopes	Bowbac
107-1	124-2 Shingle loam, 3 to 30 percent slopes	Shingle
108-1	116-2 Kishona loam, 0 to 6 percent slopes	Kishona
116-1	157-2 Bowbac fine sandy loam, 0 to 6 percent slopes	Bowbac
117-1	226 Ulm loam, 0 to 6 percent slopes	Ulm
123-1	116-3 Zigweid loam, 0 to 6 percent slopes	Zigweid
126-1	221-3 Taluce fine sandy loam, 6 to 30 percent slopes	Taluce
127-1	144 Forkwood loam 0 to 6 percent slopes	Forkwood
300	Bidman loam, 0 to 6 percent slopes	Bidman
301	235 Vonalee loam 0 to 6 percent slopes	Vonalee
302	158-1 Hiland fine sandy loam, 6 to15 percent slopes	Hiland
303	124-2 Shingle loam, 3 to 30 percent slopes	Shingle
304	127-2 Theedle loam, 0 to 30 percent slopes	Theedle
305	146-2 Cushman loam, 0 to 6 percent slopes	Cushman
306	127-2 Theedle loam, 0 to 30 percent slopes	Theedle

Table 3.3-5. Summary of Marginal and Unsuitable Parameters within the Sampled Profiles for the Moore Ranch Unit

Series	Sample Point	Depth (in)	Parameter
Hiland	19-1	24-32	Marginal texture
Hiland	19-1	32-44	Marginal texture
Hiland	19-1	44-60	Marginal SAR and marginal selenium
Cushman	36-1	3-12	Marginal texture
Cushman	36-1	12-17	Marginal texture
Cushman	36-1	17-36	Marginal texture
Cushman	36-1	36-42	Marginal texture
Cushman	37-1	7-15	Marginal texture and marginal coarse fragments
Cushman	37-1	15-18	Marginal saturation percentage and marginal texture
Cushman	37-1	18-28	Marginal saturation percentage and marginal texture
Kishona	108-1	24-30	Marginal texture
Kishona	108-1	30-44	Marginal texture
Ulm	117-1	10-21	Marginal texture
Ulm	117-1	21-32	Marginal texture
Zigweid	123-1	32-44	Marginal selenium
Zigweid	123-1	44-54	Marginal selenium
Zigweid	123-1	54-60	Marginal selenium
Forkwood	127-1	27-45	Marginal texture
Bidman	300	4-20	Marginal texture
Bidman	300	20-28	Marginal texture
Bidman	300	28-40	Marginal texture
Vonalee	301	0-2	Marginal saturation percentage
Theedle	304	0-3	Marginal texture
Theedle	306	2-20	Marginal texture

Table 3.3-6 Summary of Approximate Soil Salvage Depths Within the Moore Ranch Study Area

Map Symbol	Mapping Unit Description	Moore Ranch Unit Study Area	Salvage Depth (feet)	Total Volume (Acre feet)
144	Forkwood loam, 0 to 6 percent slopes	25.58	5.0	127.9
156	Hiland fine sandy loam, 0 to 6 percent slopes	156.14	4.5	703.33
226	Ulm loam, 0 to 6 percent slopes	39.87	4.2	167.45
235	Vonalee fine sandy loam, 0 to 10 percent slopes	30.08	5	150.4
111-1	Bidman loam, 0 to 6 percent slopes	31.5	4.2	132.3
116-2	Kishona loam, 0 to 6 percent slopes	8.79	5.0	43.95
116-3	Zigweid loam, 0 to 6 percent slopes	23.18	3.7	85.76
122-1	Cushman loam, 6 to 15 percent slopes	187.07	2.7	505.09
124-2	Shingle loam, 3 to 30 percent slopes	68.60	0.8	54.88
127-2	Theedle loam, 6 to 15 percent slopes	74.46	1.7	126.58
146-2	Cushman loam, 0 to 6 percent slopes	133.08	2.7	359.31
157-2	Bowbac fine sandy loam, 0 to 6 percent slopes	62.25	3.0	186.75
158-1	Hiland fine sandy loam, 6 to 15 percent slopes	97.56	4.5	439.02
158-2	Bowbac fine sandy loam, 6 to 15 percent slopes	35.33	5.0	176.65
171-1	Keeline, dry complex, 3 to 30 percent slopes	19.52	5.0	97.6
221-3	Taluce fine sandy loam, 6 to 30 percent slopes	5.66	0.8	4.53
Average Salvage Depth of Study Area			**3.6**	
Total		**998.67**		**3360.8**

Table 3.3-7 Summary of Wind and Water Erosion Hazards[1] Within the Moore Ranch Unit

Map Symbol	Map Unit Description	Water Erosion Hazard	Wind Erosion Hazard
110	Bidman loam, loamy substratum, 0 to 6 percent slopes	Slight	Moderate
144	Forkwood loam, 0 to 6 percent slopes	Slight	Moderate
156	Hiland fine sandy loam, 0 to 6 percent slopes	Slight	Severe
226	Ulm loam, 0 to 6 percent slopes	Slight	Moderate
227	Ulm clay loam, 0 to 6 percent slopes	Slight	Moderate
235	Vonalee fine sandy loam, 0 to 10 percent slopes	Moderate	Severe
111-1	Bidman loam, 0 to 6 percent slopes	Slight	Moderate
111-2	Parmleed loam, 0 to 6 percent slopes	Slight	Moderate
112-1	Bidman loam, 6 to 15 percent slopes	Slight	Moderate
112-2	Parmleed loam, 6 to 15 percent slopes	Slight	Moderate
116-1	Cambria loam, 0 to 6 percent slopes	Slight	Moderate
116-2	Kishona loam, 0 to 6 percent slopes	Slight	Moderate
116-3	Zigweid loam, 0 to 6 percent slopes	Slight	Moderate
117-1	Cambria loam, 6 to 15 percent slopes	Slight	Moderate
117-2	Kishona loam, 6 to 20 percent slopes	Severe	Moderate
122-1	Cushman loam, 6 to 15 percent slopes	Severe	Moderate
124-2	Shingle loam, 3 to 30 percent slopes	Severe	Moderate
127-2	Theedle loam, 0 to 30 percent slopes	Severe	Moderate
140-1	Embry sandy loam, 3 to 20 percent slopes	Moderate	Severe
146-2	Cushman loam, 0 to 6 percent slopes	Severe	Moderate
147-1	Forkwood loam, 6 to 15 percent slopes	Slight	Moderate
153-1	Haverdad clay loam, 0 to 6 percent slopes	Slight	Moderate
153-2	Kishona clay loam, 0 to 6 percent slopes	Slight	Moderate
157-2	Bowbac fine sandy loam, 0 to 6 percent slopes	Slight	Severe
158-1	Hiland fine sandy loam, 6 to 15 percent slopes	Slight	Severe
158-2	Bowbac fine sandy loam, 6 to 15 percent slopes	Slight	Severe
170-2	Tullock loamy sand, 6 to 30 percent slopes	Slight	Severe
171-1	Keeline, dry complex, 3 to 30 percent slopes	Moderate	Severe
194-1	Pugsley sandy loams, 6 to 15 percent slopes	Severe	Severe

Table 3.3-7 Summary of Wind and Water Erosion Hazards[1] Within the Moore Ranch Unit

Map Symbol	Map Unit Description	Water Erosion Hazard	Wind Erosion Hazard
194-2	Decolney sandy loams, 6 to 15 percent slopes	Severe	Severe
205-1	Samday clay loam, 3 to 15 percent slopes	Severe	Moderate
213-1	Terro sandy loam, 6 to 30 percent slopes	Severe	Severe
216-2	Kishona loam, 6 to 30 percent slopes	Severe	Severe
221-1	Turnercrest fine sandy loam, 6 to 30 percent slopes	Severe	Severe
221-3	Taluce fine sandy loam, 6 to 30 percent slopes	Severe	Severe
228-2	Renohill clay loam, 0 to 6 percent slopes	Moderate	Moderate
236-2	Terro fine sandy loam, 2 to 10 percent slopes	Moderate	Severe

[1]Based on soil mapping unit descriptions.

3.3.6 Seismology

3.3.6.1 Historic Seismicity

Historic seismic events for Campbell County and other counties surrounding the Moore Ranch Project area including Natrona, Converse, and Johnson Counties are summarized below.

Campbell County

Five magnitude 2.5 and greater earthquakes have been recorded in Campbell County. The first earthquake recorded in the county occurred on May 11, 1967. This magnitude 4.8 earthquake was centered in southwestern Campbell County approximately 7 miles west-northwest of Pine Tree Junction. The second event took place on February 18, 1972, when a magnitude 4.3 earthquake occurred approximately 18 miles east of Gillette. No damage was reported for either event.

Two earthquakes were recorded in Campbell County during the 1980s. On May 29, 1984, a magnitude 5.0, intensity V earthquake occurred approximately 24 miles west-southwest of Gillette. The earthquake was felt in Gillette, Sheridan, Buffalo, Casper, Douglas, Thermopolis, and Sundance. On October 29, 1984, a magnitude 2.5 earthquake occurred approximately 25 miles west-northwest of Gillette. No damage was reported.

Most recently, on February 24, 1993, a magnitude 3.6 earthquake occurred in southeastern Campbell County approximately 10 miles east-southeast of Reno Junction. No damage was reported.

Natrona County

Twelve magnitude 2.5 or intensity III and greater earthquakes have been recorded in Natrona County. The first earthquake that occurred in Natrona County took place on December 10, 1873, approximately 2 miles south of Powder River. People in the area reported feeling the earthquake as an intensity III event. Two of the earliest recorded earthquakes in Wyoming occurred near Casper. On June 25, 1894, an estimated intensity V earthquake was reported approximately 3 miles southwest of Evansville. Residents on Casper Mountain reported that dishes rattled to the floor and people were thrown from their beds. Water in the Platte River changed from fairly clear to reddish, and became thick with mud due to the riverbanks slumping into the river during the earthquake (Mokler, 1923). An even larger earthquake was felt in the same area on November 14, 1897. This intensity VI-VII earthquake, one of the largest recorded in central and eastern Wyoming caused considerable damage to a few buildings. On October 25, 1922, an intensity IV-V earthquake was detected approximately 6 miles north northeast of Barr

Nunn. The event was felt in Casper; at Salt Creek, 50 miles north of Casper; and at Bucknum, 22 miles west of Casper. No significant damage was reported at Casper.

One of the first earthquakes recorded near Midwest occurred on December 11, 1942. The intensity IV-V event occurred approximately 14 miles south of Midwest. Although no damage was reported, the event was felt in Casper, Salt Creek, and Glenrock. On August 27, 1948, another intensity IV earthquake was detected approximately 6 miles north-northeast of Bar Nunn. No damage was reported.

In the 1950's, two earthquakes caused some concern among Casper residents. On January 23, 1954, an intensity IV earthquake occurred approximately 7 miles northeast of Alcova. No damage was reported. On August 19, 1959, an intensity IV earthquake was recorded north of Casper, approximately 6 miles north-northeast of Bar Nunn. People in Casper reported feeling this event however it is uncertain if this earthquake actually occurred in the Casper area, as it coincides with the Hebgen Lake, Montana, earthquakes that initiated on August 17, 1959.

Only one earthquake was reported in Natrona County in the 1960s. On January 8, 1968, a magnitude 3.8 earthquake occurred approximately 10 miles north-northwest of Alcova. No damage was reported.

An earthquake of no specific magnitude or intensity occurred approximately 13 miles southeast of Ervay on June 16, 1973. No one felt this earthquake and no damage was reported.

No other earthquakes occurred in Natrona County until March 9, 1993, when a magnitude 3.2 earthquake was recorded 17 miles west of Midwest. No damage was reported. A magnitude 3.1 earthquake also occurred in the far northwestern corner of the county on November 9, 1999. No one reported feeling this earthquake that was centered approximately 32 miles northwest of Waltman.

Most recently, on February 1, 2003, a magnitude 3.7 earthquake occurred approximately 16 miles north-northeast of Casper. Numerous Casper residents felt this event.

<u>Converse County</u>

Twelve magnitude 3.0 and greater earthquakes have been recorded in Converse County. These earthquakes are discussed below. The first earthquake recorded in Converse County occurred on April 14, 1947. The earthquake had an intensity of V, and was felt near LaPrele Creek southwest of Douglas.

On August 21, 1952, an intensity IV earthquake occurred approximately 7 miles north-northeast of Esterbrook, in Converse County. It was felt by several people in the area, and was reportedly felt 40 miles to the southwest of Esterbrook. Three additional earthquakes have occurred in the same location as the August 21, 1952 event. The first, a small magnitude event with no associated magnitude or intensity, occurred on September 2, 1952. The second, an intensity III event, occurred on January 5, 1957. The most recent, an intensity IV event occurred on March 31, 1964. No damage was reported for any of the events.

On January 15, 1978, a magnitude 3.0, intensity III earthquake occurred approximately 3 miles northeast of Esterbrook, in Converse County. No damage was reported.

Two earthquakes occurred in Converse County in the 1980's. On November 15, 1983, a magnitude 3.0, intensity III earthquake occurred approximately 15 miles northeast of Casper in western Converse County. No damage was reported. On December 5, 1984, a non-damaging magnitude 2.9 earthquake occurred in the Laramie Range in southern Converse County.

Four earthquakes occurred in Converse County in the 1990's. On June 30, 1993, a magnitude 3.0 earthquake was located approximately 15 miles north of Douglas. No damage was reported. On July 23, 1993, a magnitude 3.7, intensity IV earthquake occurred in southern Converse County, approximately 13 miles north-northwest of Toltec in northern Albany County. This event was felt as far away as Laramie. On December 13, 1993, another earthquake occurred approximately 8 miles east of Toltec. This non-damaging event had a magnitude of 3.5. Most recently, on October 19, 1996, a magnitude 4.2 earthquake was recorded approximately 15 miles northeast of Casper in western Converse County. No damage was reported, although the event was felt by many Casper residents.

Johnson County

Eight magnitude 2.5 and greater earthquakes have been recorded in Johnson County. The first earthquake recorded in the county occurred on October 24, 1922. The location was originally determined to be near Buffalo, and classified the event as an intensity II earthquake. Based upon a description of the earthquake in the October 27, 1922 edition of the Sheridan Post, however, the location and assigned intensity may be in error. The Sheridan Post reported that at Cat Creek, 8 miles east of Sheridan, houses were shaken and dishes were rattled. In addition, the October 26, 1922 edition of the Sheridan Post reports that only a slight earthquake shock was felt in Sheridan. Based upon this information, it seems reasonable to locate the earthquake 8 miles east of Sheridan, and to assign an intensity of IV-V to the event.

On September 6, 1943, an intensity IV earthquake was felt in the Sheridan area, although the epicenter was determined to be approximately 3-4 miles south-southwest of Buffalo. Beds and chairs were reported "to sway" in the Sheridan area.

Two earthquakes were recorded in Johnson County in the 1960s. A magnitude 4.7 earthquake occurred on June 3, 1965. This event was centered approximately 12 miles south of Kaycee. On April 12, 1966, an earthquake of no specified magnitude or intensity was detected approximately 25 miles southwest of Buffalo. No one reported feeling these events.

On September 2, 1976, a magnitude 4.8, intensity IV-V earthquake was felt in Kaycee. The event was located approximately 33 miles northeast of Kaycee. No damage was reported.

A magnitude 5.1, intensity V earthquake occurred on September 7, 1984, approximately 33 miles east-southeast of Buffalo. The earthquake was felt throughout northeastern Wyoming, including Buffalo, Casper, Kaycee, Linch, and Midwest, and in parts of southeastern Montana. No significant damage was reported.

Two earthquakes were detected in Johnson County in 1992. The first occurred on February 22, 1992. This magnitude 2.9 event was recorded approximately 18 miles east of Buffalo. As expected with such a small earthquake, no damage was reported. Most recently, a magnitude 3.6, intensity IV earthquake occurred on August 30, 1992. The earthquake was centered near Mayoworth, approximately 22 miles west-northwest of Kaycee. It was felt in Barnum and Kaycee, but no damage was reported.

3.3.6.2 Deterministic Analysis of Regional Active Faults with a Surficial Expression

There are no known exposed active faults with a surficial expression in Campbell County. As a result, no fault-specific analysis can be generated for Campbell County.

3.3.6.3 Floating or Random Earthquake Sources

Many federal regulations require an analysis of the earthquake potential in areas where active faults are not exposed, and where earthquakes are tied to buried faults with no surface expression. Regions with a uniform potential for the occurrence of such earthquakes are called tectonic provinces. Within a tectonic province, earthquakes associated with buried faults are assumed to occur randomly, and as a result can theoretically occur anywhere within that area of uniform earthquake potential. In reality, that random distribution may not be the case, as all earthquakes are associated with specific faults. If all buried faults have not been identified, however, the distribution has to be considered random. "Floating earthquakes" are earthquakes that are considered to occur randomly in a tectonic province.

It is difficult to accurately define tectonic provinces when there is a limited historic earthquake record. When there are no nearby seismic stations that can detect small-magnitude earthquakes, which occur more frequently than larger events, the problem is compounded. Under these conditions, it is common to delineate larger, rather than smaller, tectonic provinces.

The U.S. Geological Survey identified tectonic provinces in a report titled "Probabilistic Estimates of Maximum Acceleration and Velocity in Rock in the Contiguous United States" (Algermissen and others, 1982). In that report, Campbell County was classified as being in a tectonic province with a "floating earthquake" maximum magnitude of 6.1. Geomatrix (1988b) suggested using a more extensive regional tectonic province, called the "Wyoming Foreland Structural Province", which is approximately defined by the Idaho-Wyoming Thrust Belt on the west, 104° West longitude on the east, 40° North latitude on the south, and 45° North latitude on the north. Geomatrix (1988b) estimated that the largest "floating" earthquake in the "Wyoming Foreland Structural Province" would have a magnitude in the 6.0 – 6.5 range, with an average value of magnitude 6.25.

Federal or state regulations usually specify if a "floating earthquake" or tectonic province analysis is required for a facility. Usually, those regulations also specify at what distance a floating earthquake is to be placed from a facility. For example, for uranium mill tailings sites, the Nuclear Regulatory Commission requires that a floating earthquake be placed 15 kilometers from the site. That earthquake is then used to determine what horizontal accelerations may occur at the site. A magnitude 6.25 "floating" earthquake, placed 15 kilometers from any structure in Campbell County, would generate horizontal accelerations of approximately 15%g at the site. Critical facilities, such as dams, usually require a more detailed probabilistic analysis of random earthquakes. Based upon probabilistic analyses of random earthquakes in an area distant from exposed active faults (Geomatrix, 1988b), however, placing a magnitude 6.25 earthquake at 15 kilometers from a site will provide a fairly reasonable estimate of design ground accelerations in the northeastern and eastern parts of Campbell County, but will be inadequate in the southwestern part of the county.

3.3.6.4 Probabilistic Seismic Hazard Analyses

The U.S. Geological Survey (USGS) publishes probabilistic acceleration maps for 500-, 1000- and 2,500-year time frames. The maps show what accelerations may be met or exceeded in those time frames by expressing the probability that the accelerations will be met or exceeded in a shorter time frame. For example, a 10% probability that acceleration may be met or exceeded in 50 years is roughly equivalent to a 100% probability of exceedance in 500 years.

The USGS has recently generated new probabilistic acceleration maps for Wyoming (Case, 2000). Copies of the 500-year (10% probability of exceedance in 50 years), 1000-year (5% probability of exceedance in 50 years), and 2,500-year (2% probability of exceedance in 50 years) maps are attached. Until recently, the 500-year map was often used for planning purposes for average structures, and was the basis of the most current Uniform Building Code. Recently, the UBC has been replaced by the International

Building Code (IBC), which is based upon probabilistic analyses. Campbell County adopted the IBC in 2005. The new International Building Code, however, uses a 2,500-year map as the basis for building design. The maps reflect current perceptions on seismicity in Wyoming. In many areas of Wyoming, ground accelerations shown on the USGS maps can be increased due to local soil conditions. For example, if fairly soft, saturated sediments are present at the surface, and seismic waves are passed through them, surface ground accelerations will usually be greater than would be experienced if only bedrock was present. In this case, the ground accelerations shown on the USGS maps would underestimate the local hazard, as they are based upon accelerations that would be expected if firm soil or rock were present at the surface. Intensity values and descriptions can be found in Table 3.3-8 and Table 3.3-9.

Based upon the 500-year map (10% probability of exceedance in 50 years) (Figure 3.3-15), the estimated peak horizontal acceleration in Campbell County ranges from approximately 3%g in the northeastern corner of the county to greater than 6%g in the southwestern corner of the county. These accelerations are roughly comparable to intensity IV earthquakes (1.4%g – 3.9%g) to intensity V earthquakes (3.9%g – 9.2%g). These accelerations are comparable to the accelerations to be expected in Seismic Zones 0 and 1 of the Uniform Building Code. Intensity IV earthquakes cause little damage. Intensity V earthquakes can result in cracked plaster and broken dishes. Gillette would be subjected to an acceleration of approximately 5%g or intensity V.

Based upon the 1000-year map (5% probability of exceedance in 50 years) (Figure 3.3-16), the estimated peak horizontal acceleration in Campbell County ranges from 4%g in the northeastern corner of the county to greater than 10%g in the southwestern quarter of the county. These accelerations are roughly comparable to intensity V earthquakes (3.9%g – 9.2%g) to intensity VI earthquakes (9.2%g – 18%g). Intensity V earthquakes can result in cracked plaster and broken dishes. Intensity VI earthquakes can result in fallen plaster and damaged chimneys. Depending upon local ground conditions, Gillette would be subjected to an acceleration of approximately 9%g or greater and intensity V or VI.

Based upon the 2500-year map (2% probability of exceedance in 50 years) (Figure 3.3-17), the estimated peak horizontal acceleration in Campbell County ranges from 8%g in the northeastern corner of the county to greater than 20%g in the southwestern corner of the county. These accelerations are roughly comparable to intensity V earthquakes (3.9%g – 9.2%g), intensity VI earthquakes (9.2%g – 18%g), and intensity VII earthquakes (18%g – 34%g). Intensity V earthquakes can result in cracked plaster and broken dishes. Intensity VI earthquakes can result in fallen plaster and damaged chimneys. Intensity VII earthquakes can result in slight to moderate damage in well-built ordinary structures, and considerable damage in poorly built or badly designed structures, such as unreinforced masonry. Chimneys may be broken. Gillette would be subjected to an acceleration of approximately 18%g or intensity VI to VII.

As the historic record is limited, it is nearly impossible to determine when a 2,500-year event last occurred in the county. Because of the uncertainty involved, and based upon the fact that the new International Building Code utilizes 2,500-year events for building design, it is suggested that the 2,500-year probabilistic maps be used for Campbell County analyses. This conservative approach is in the interest of public safety.

Table 3.3-8: Modified Mercalli Intensity and Peak Ground Acceleration

Modified Mercalli Intensity	Acceleration (%g) (PGA)	Perceived Shaking	Potential Damage
I	<0.17	Not felt	None
II	0.17 – 1.4	Weak	None
III	0.17 – 1.4	Weak	None
IV	1.4 – 3.9	Light	None
V	3.9 – 9.2	Moderate	Very Light
VI	9.2 – 18	Strong	Light
VII	18 – 34	Very Strong	Moderate
VIII	34 – 65	Severe	Moderate to Heavy
IX	65 – 124	Violent	Heavy
X	>124	Extreme	Very Heavy
XI	>124	Extreme	Very Heavy
XII	>124	Extreme	Very Heavy

Table 3.3-9 Abridged Modified Mercalli Intensity Scale

Intensity value and description:

I Not felt except by a very few under especially favorable circumstances.

II Felt only by a few persons at rest, especially on upper floors of buildings. Delicately suspended objects may swing.

III Felt quite noticeably indoors, especially on upper floors of buildings, but many people do not recognize it as an earthquake. Standing automobiles may rock slightly. Vibration like passing of truck. Duration estimated.

IV During the day felt indoors by many, outdoors by few. At night some awakened. Dishes, windows, doors disturbed; walls make creaking sound. Sensation like heavy truck striking building. Standing automobiles rocked noticeably.

V Felt by nearly everyone, many awakened. Some dishes, windows, and so on broken; cracked plaster in a few places; unstable objects overturned. Disturbances of trees, poles, and other tall objects sometimes noticed. Pendulum clocks may stop.

VI Felt by all, many frightened and run outdoors. Some heavy furniture moved; a few instances of fallen plaster and damaged chimneys. Damage slight.

VII Everybody runs outdoors. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving cars.

VIII Damage slight in specially designed structures; considerable in ordinary substantial buildings with partial collapse; great in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. Persons driving cars disturbed.

IX Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb; great in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken.

X Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations; ground badly cracked. Rails bent. Landslides considerable from river banks and steep slopes. Shifted sand and mud. Water splashed, slopped over banks.

XI Few, if any, (masonry) structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipelines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.

XII Damage total. Waves seen on ground surface. Lines of sight and level distorted. Objects thrown into the air.

Figure 3.3-15. 500-year probabilistic acceleration map, 10% probability of exceedance in 50 years (Wyoming State Geological Survey, 2002).

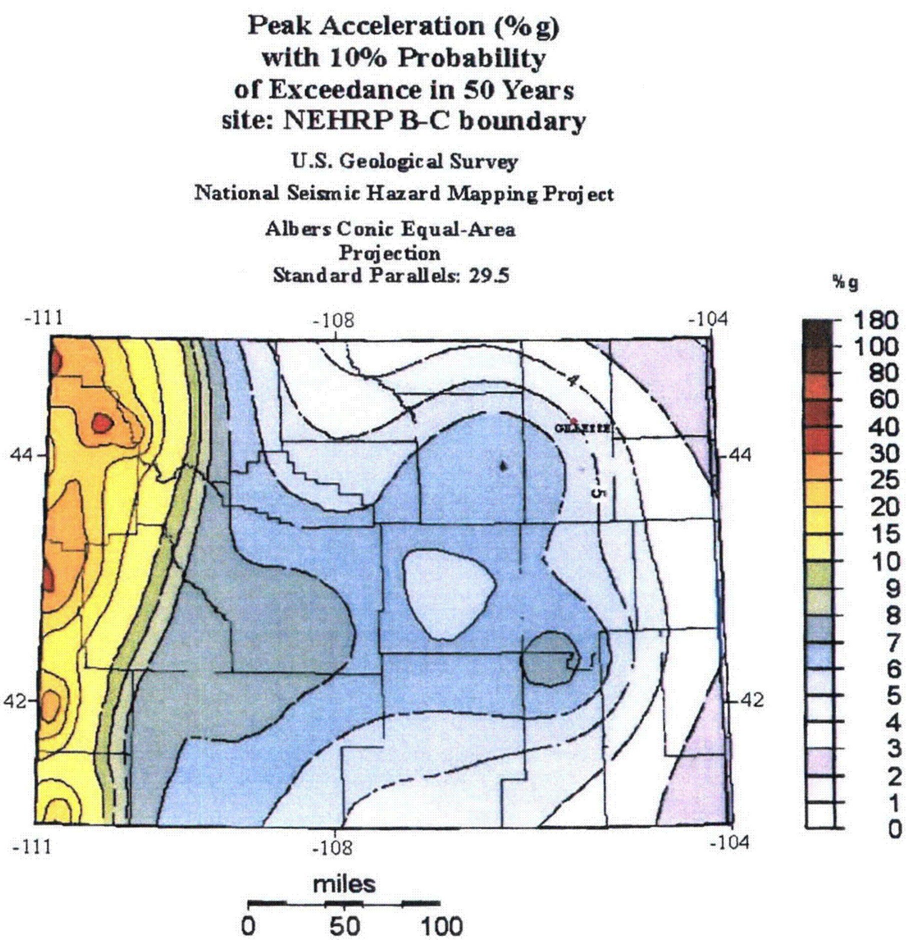


Figure 3.3-16. 1000-year probabilistic acceleration map, 5% probability of exceedance in 50 years (Wyoming State Geological Survey, 2002).

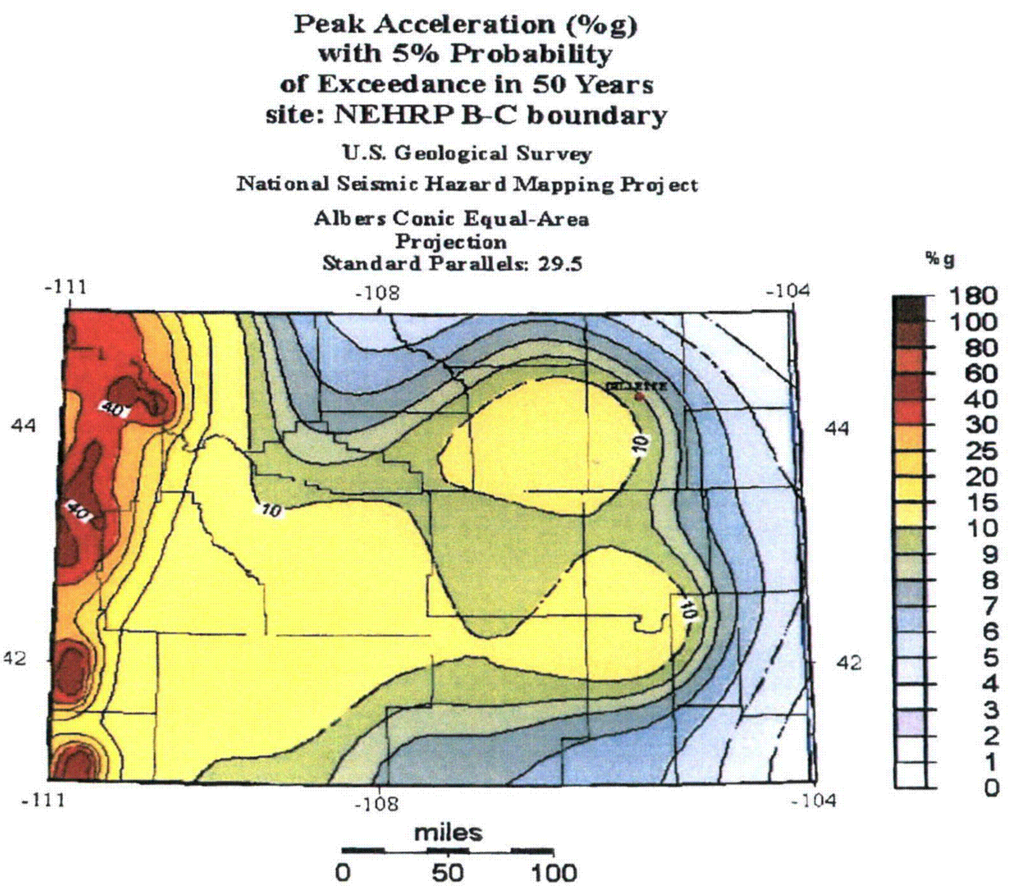
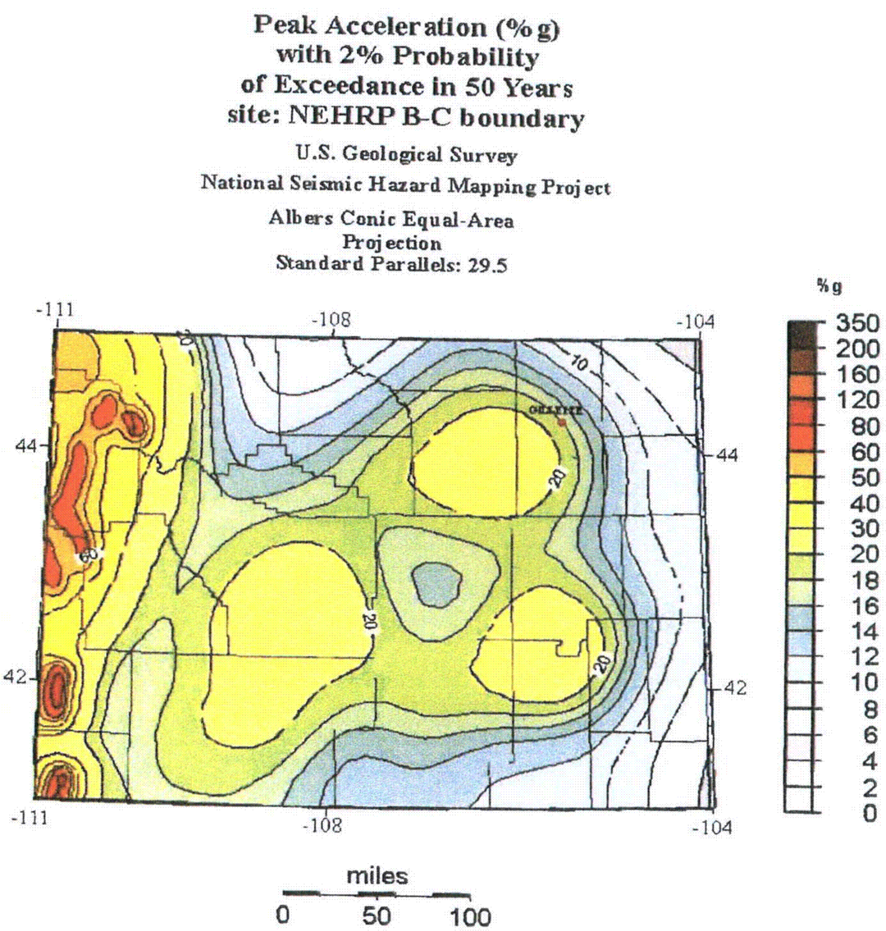


Figure 3.3-17. 2500-year probabilistic acceleration map, 2% probability of exceedance in 50 years (Wyoming State Geological Survey, 2002).



Current earthquake probability maps that are used in the newest building codes (2,500 year maps) suggest a scenario that would result in moderate damage to buildings and their contents, with damage increasing from the northeast to the southwest. More specifically, the probability-based worst-case scenario could result in the following damage at points throughout Campbell and surrounding Counties:

Intensity VII Earthquake Areas

Gillette
Savageton
Wright
Casper
Edgerton
Midwest
Bar Nunn
Mills
Evansville
Hiland
Ervay
Barnum
Buffalo
Kaycee
Linch
Mayoworth
Sussex
Boxelder
Douglas
Glenrock
Orin
Orpha
Rolling Hills

In intensity VII earthquakes, damage is negligible in buildings of good design and construction, slight-to-moderate in well-built ordinary structures, considerable in poorly built or badly designed structures such as unreinforced masonry buildings. Some chimneys will be broken.

Intensity VI Earthquake Areas

Recluse
Rozet
Spotted Horse
Weston
Alcova

Arminto
Natrona
Powder River
Waltman
Bill
Lost Springs
Shawnee

In intensity VI earthquakes, some heavy furniture can be moved. There may be some instances of fallen plaster and damaged chimneys.

Intensity V Earthquake Areas

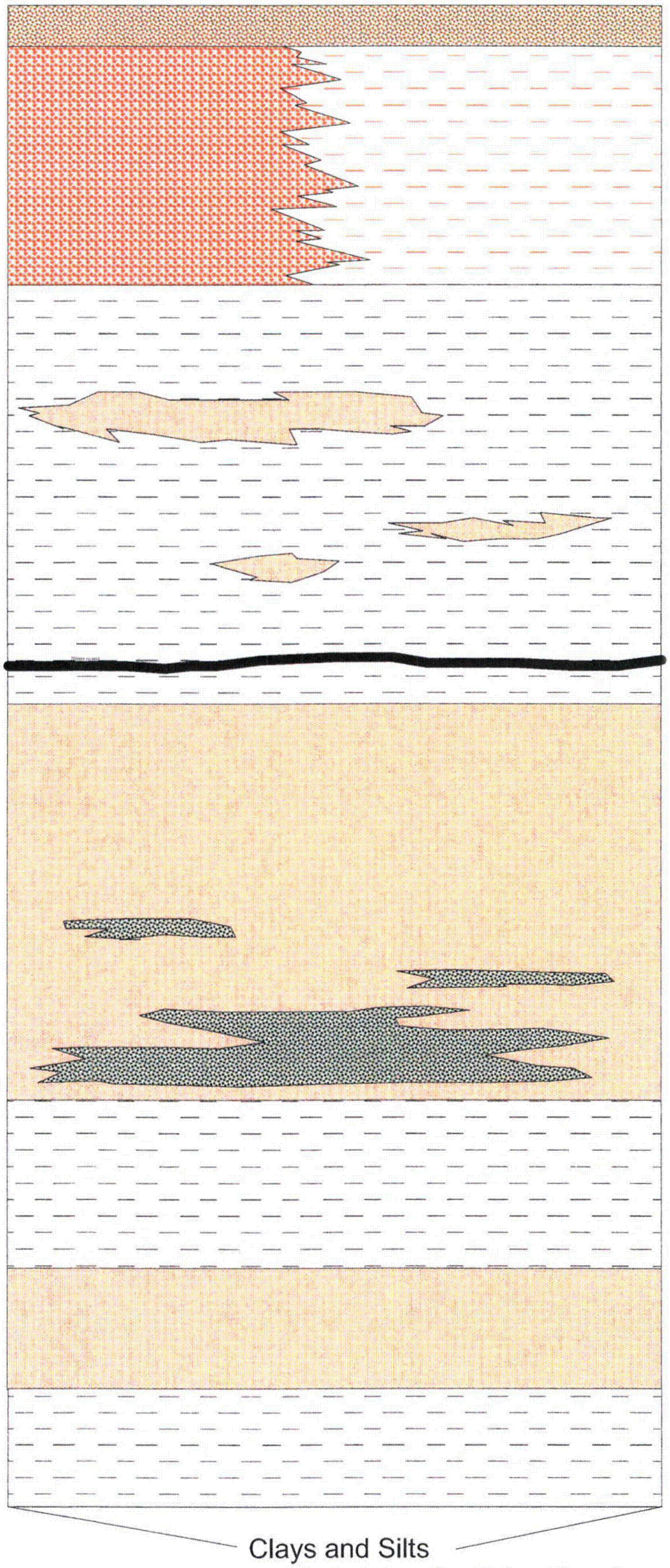
Rockypoint

In intensity V earthquakes, dishes and windows can break and plaster can crack. Unstable objects may overturn. Tall objects such as trees and power poles can be disturbed.

ADDENDUM 3.3-A

Section 3.3-2 through 3.3-4 - Figures and Tables

Section 3.3-2 Figures



ENERGYMETALS CORPORATION
139 West 2nd Street, Casper, WY 82601
307-234-8235
www.energymetalscorp.com

Figure 3.3-1
Moore Ranch Generalized Stratigraphic Section

Project: 312-4-3	Date: September 2007
Dwg: MRPT Fig 2-1.SRF	By: KRS Checked: HPD

Petrotek
10266 West Chatfield Ave., Ste 201
Littleton, Colorado 80127-4239
303-290-9414
www.petrotek.com

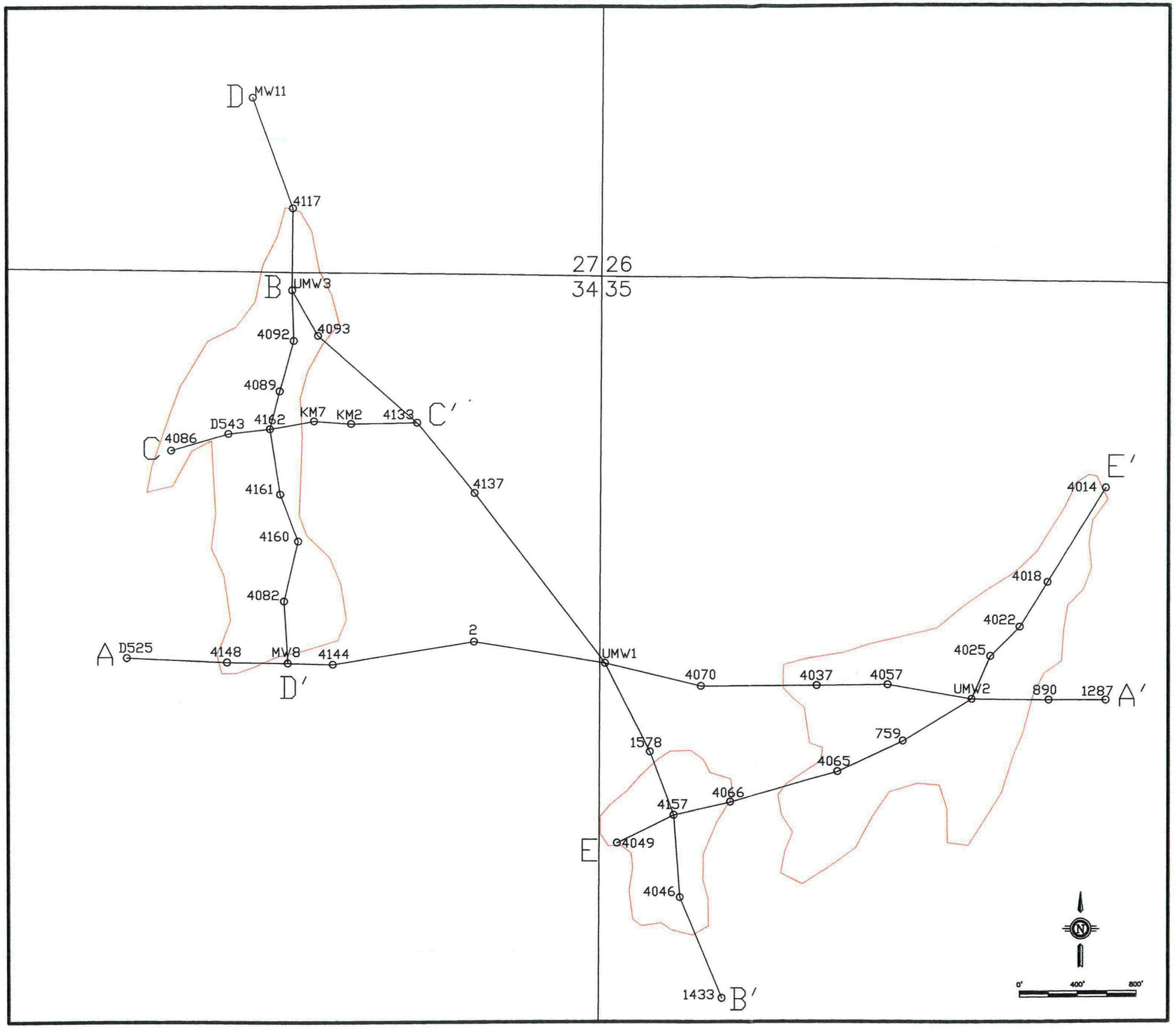


Figure 3.3-2

ENERGY METALS CORPORATION, US
139 West 2nd St. Casper, WY 82601 307-234-8235

REVISIONS		
NO.	DATE	BY

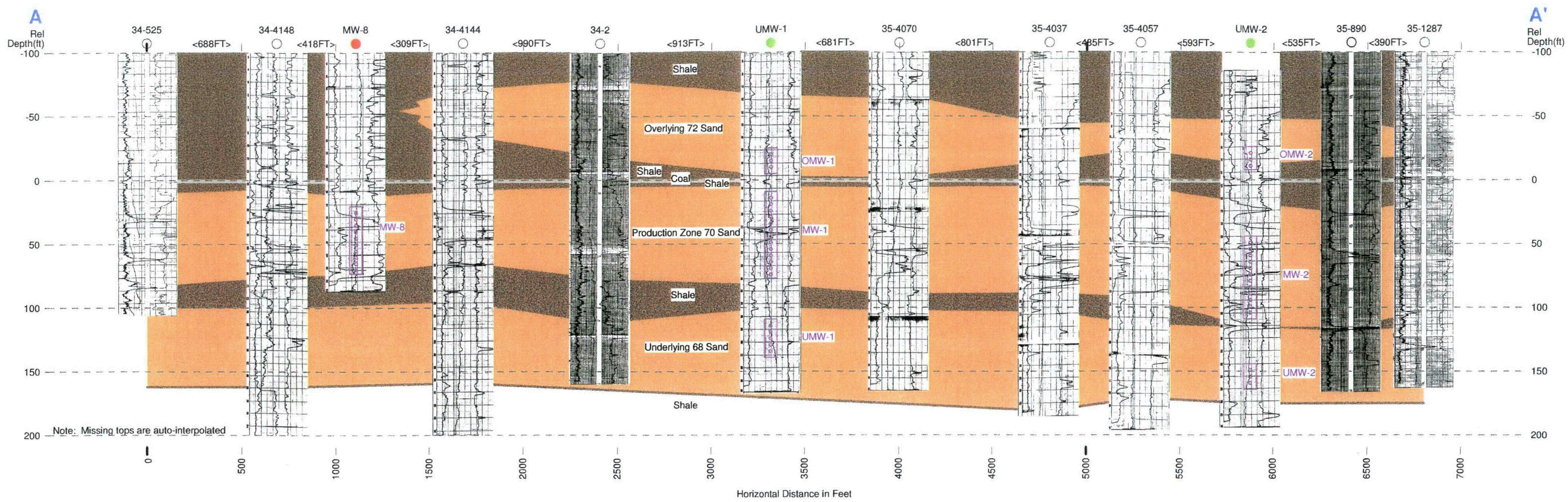
MOORE RANCH PROJECT

Cross Section Index Map

SECT. 26, 27, 34, 35, T. 42 N., R. 75 W.

GEOL. BY:	DATE:	APPR. BY:	DATE:
ENG. BY:	DATE:	APPR. BY:	DATE:
DRAFT. BY:	DATE:	SCALE:	FILE:

SHT. NO.



Petrotek

ENERGY METALS CORPORATION

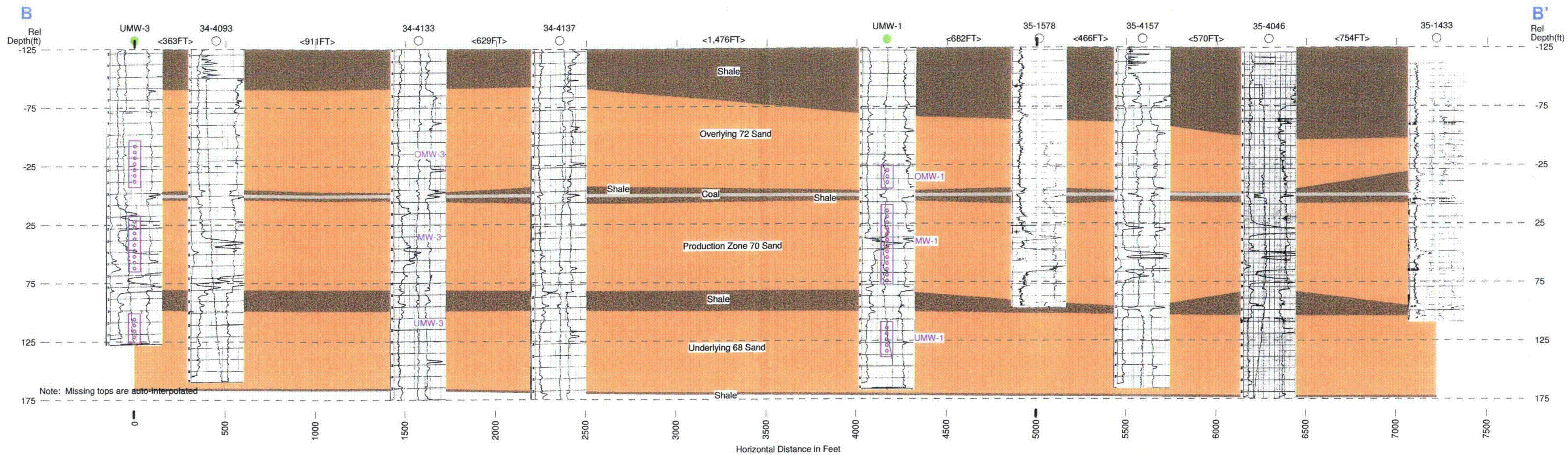
Figure 3.3-3

NRC License Application Technical Report

Stratigraphic Cross Section A-A'

August 2007

By: KRS Checked: HPD/EL



Petrotek

ENERGY METALS CORPORATION

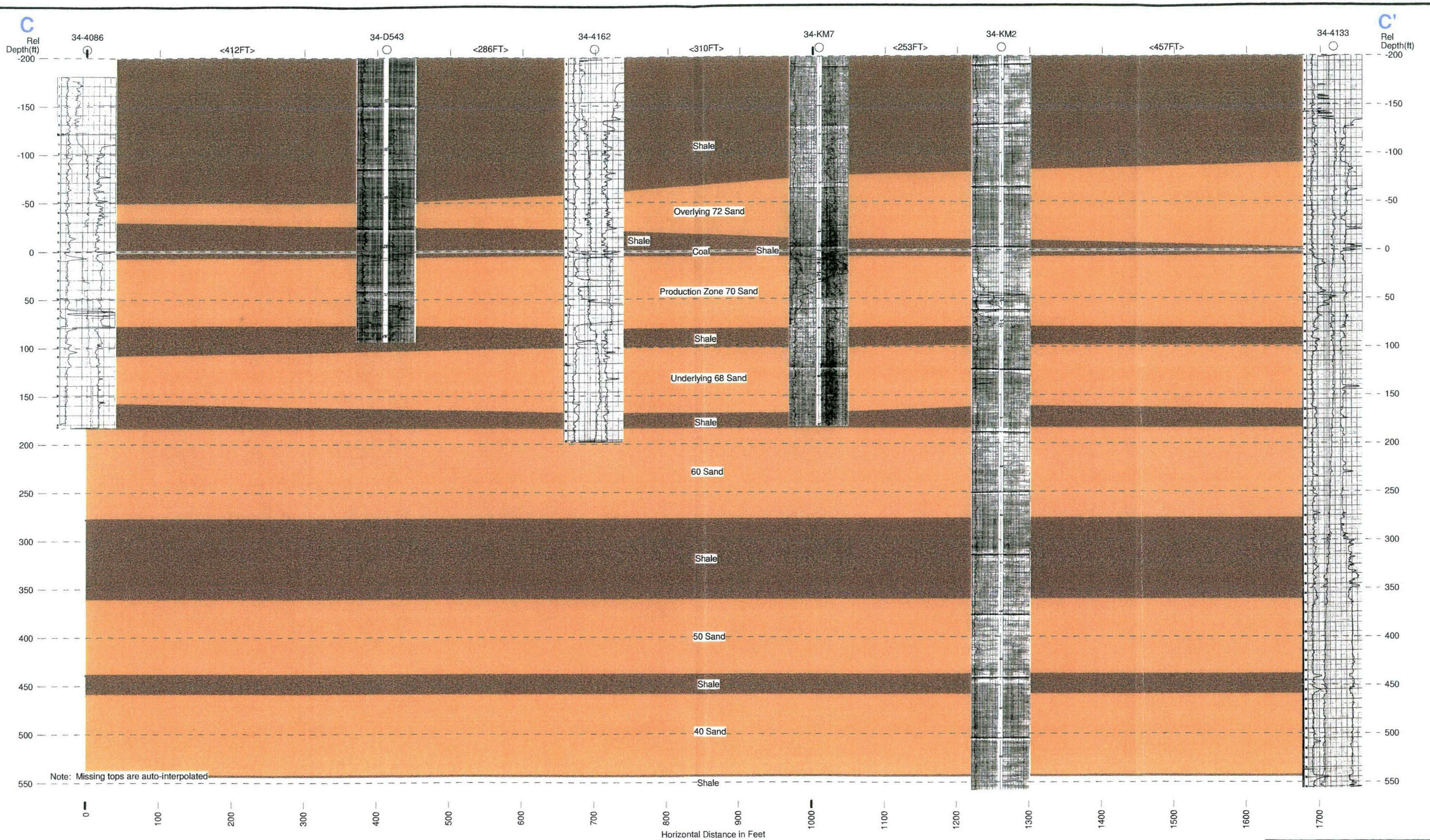
Figure 3.3-4

NRC License Application Technical Report

Stratigraphic Cross Section B-B'

August 2007

By: KRS Checked: HPD/EL



Petrotek

ENERGY METALS CORPORATION

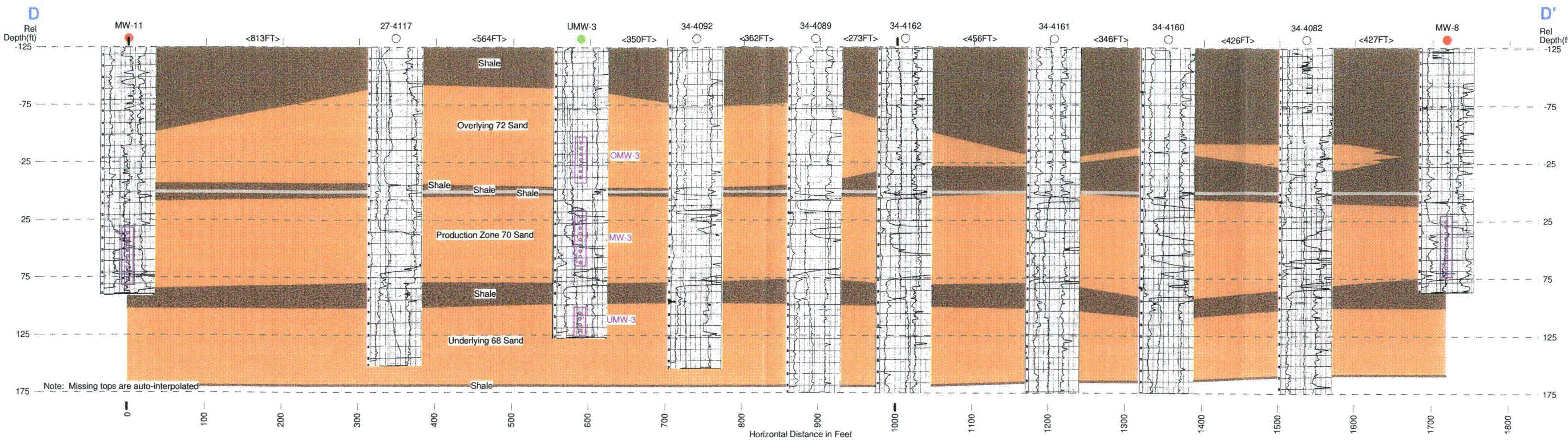
Figure 3.3-5

NRC License Application Technical Report

Stratigraphic Cross Section C-C'

August 2007

By: KRS Checked: HPD/EL



Petrotek

ENERGY METALS CORPORATION

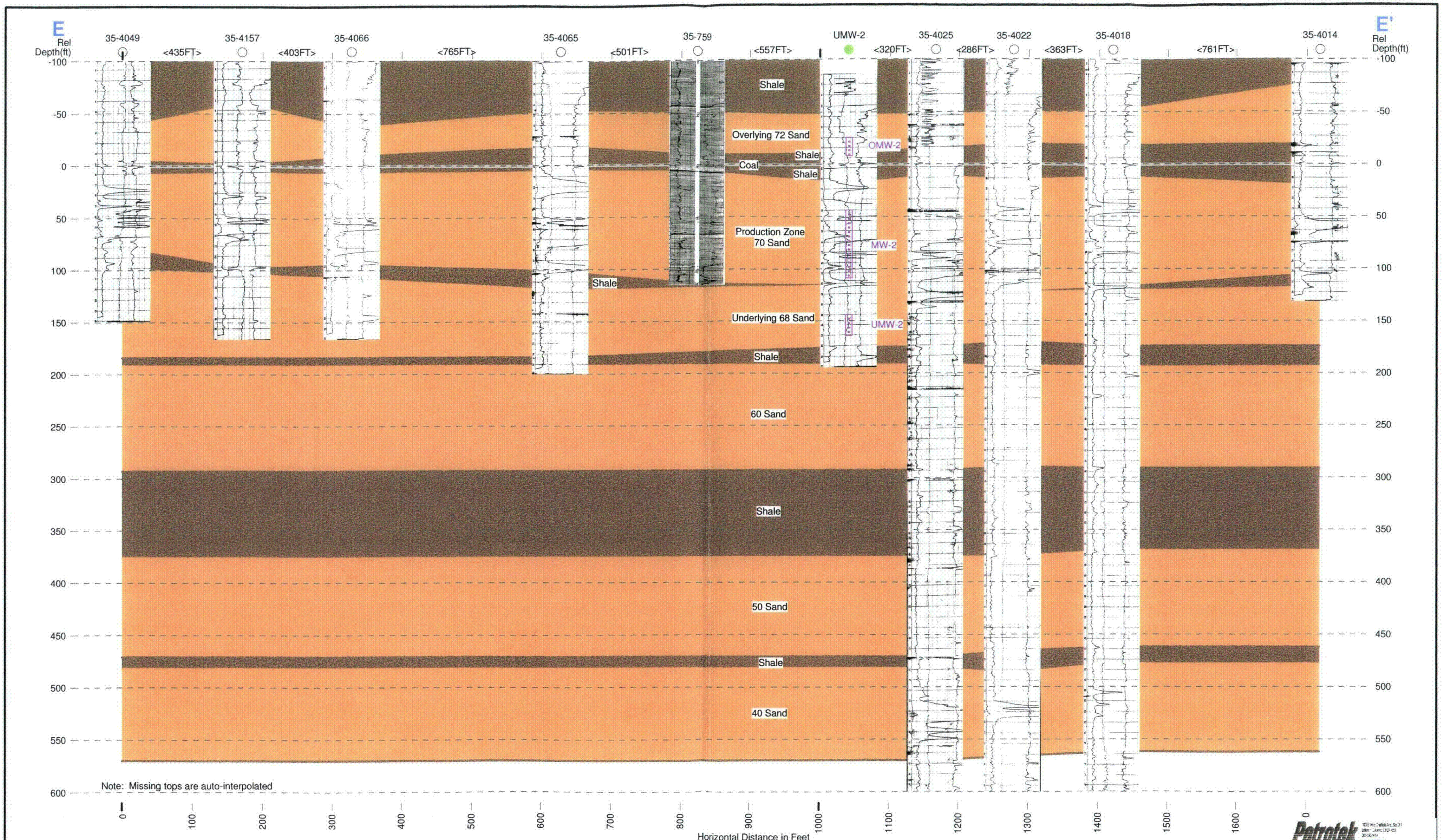
Figure 3.3-6

NRC License Application Technical Report

Stratigraphic Cross Section D-D'

August 2007

By: KRS Checked: HPD/EL



ENERGY METALS CORPORATION

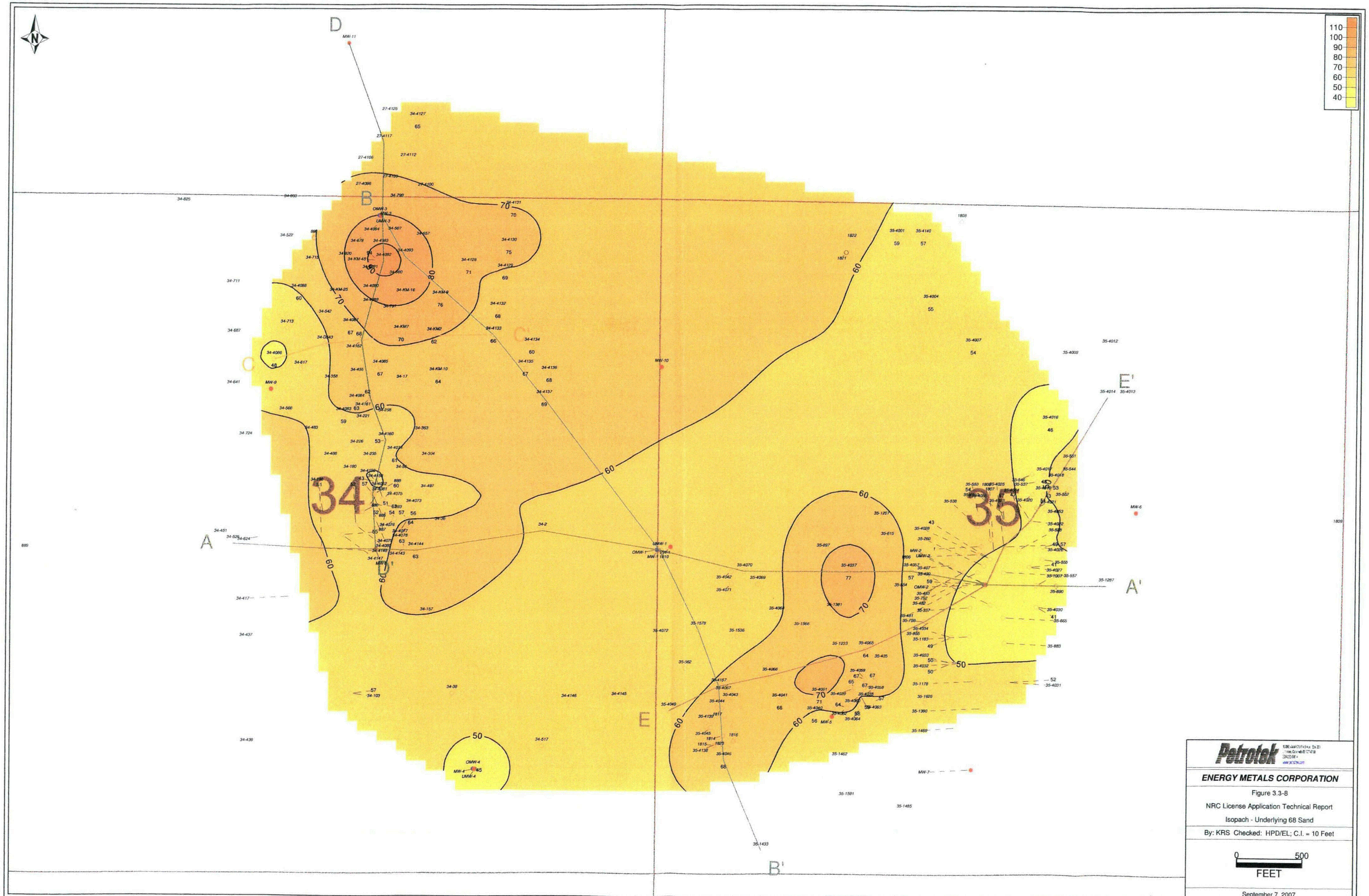
Figure 3.3-7

NRC License Application Technical Report

Stratigraphic Cross Section E-E'

August 2007

By: KRS Checked: HPD/EL



Petrotek

ENERGY METALS CORPORATION

Figure 3.3-8

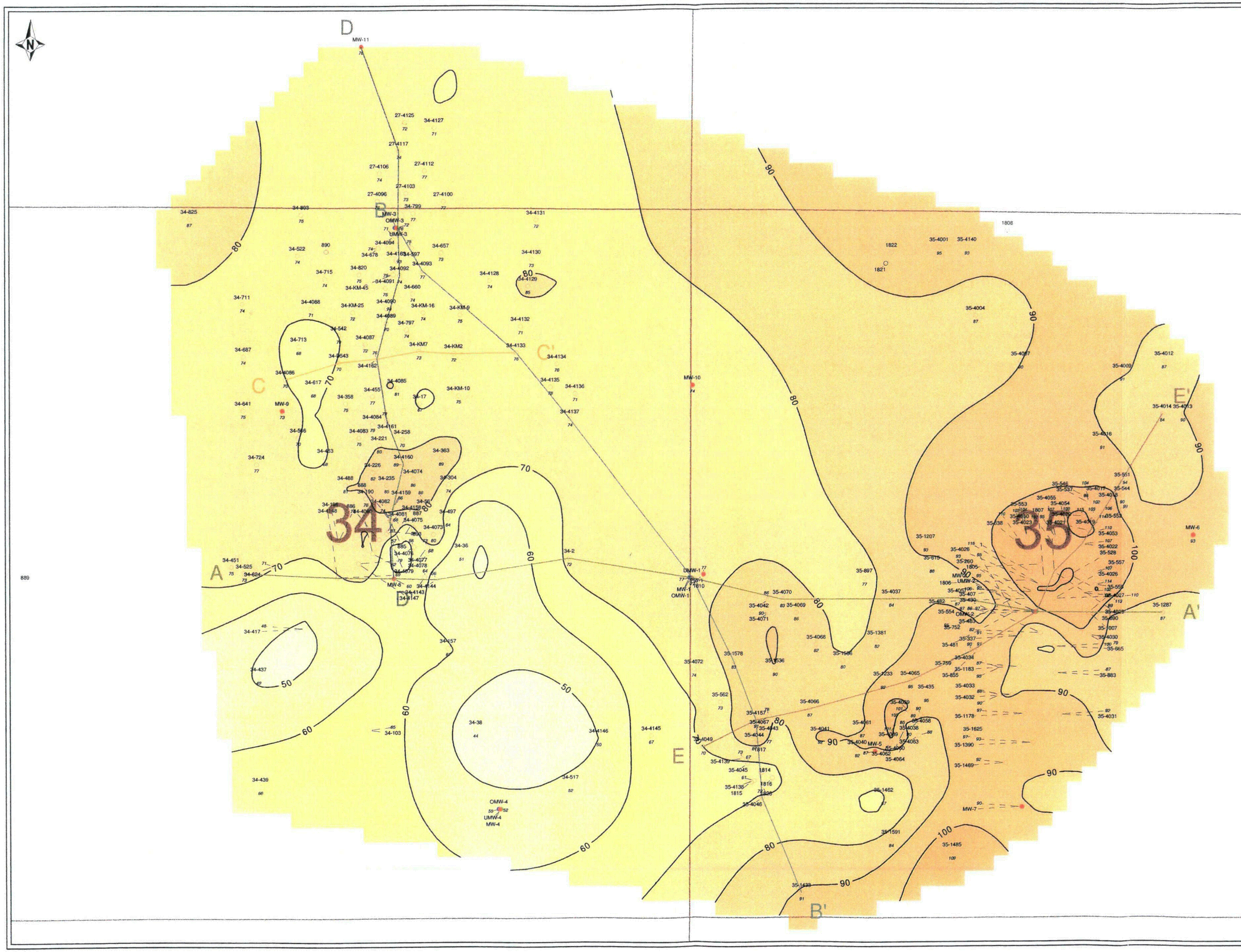
NRC License Application Technical Report

Isopach - Underlying 68 Sand

By: KRS Checked: HPD/EL; C.I. = 10 Feet

0 500 FEET

September 7, 2007



Petrotek

ENERGY METALS CORPORATION

Figure 3.3-9

NRC License Application Technical Report

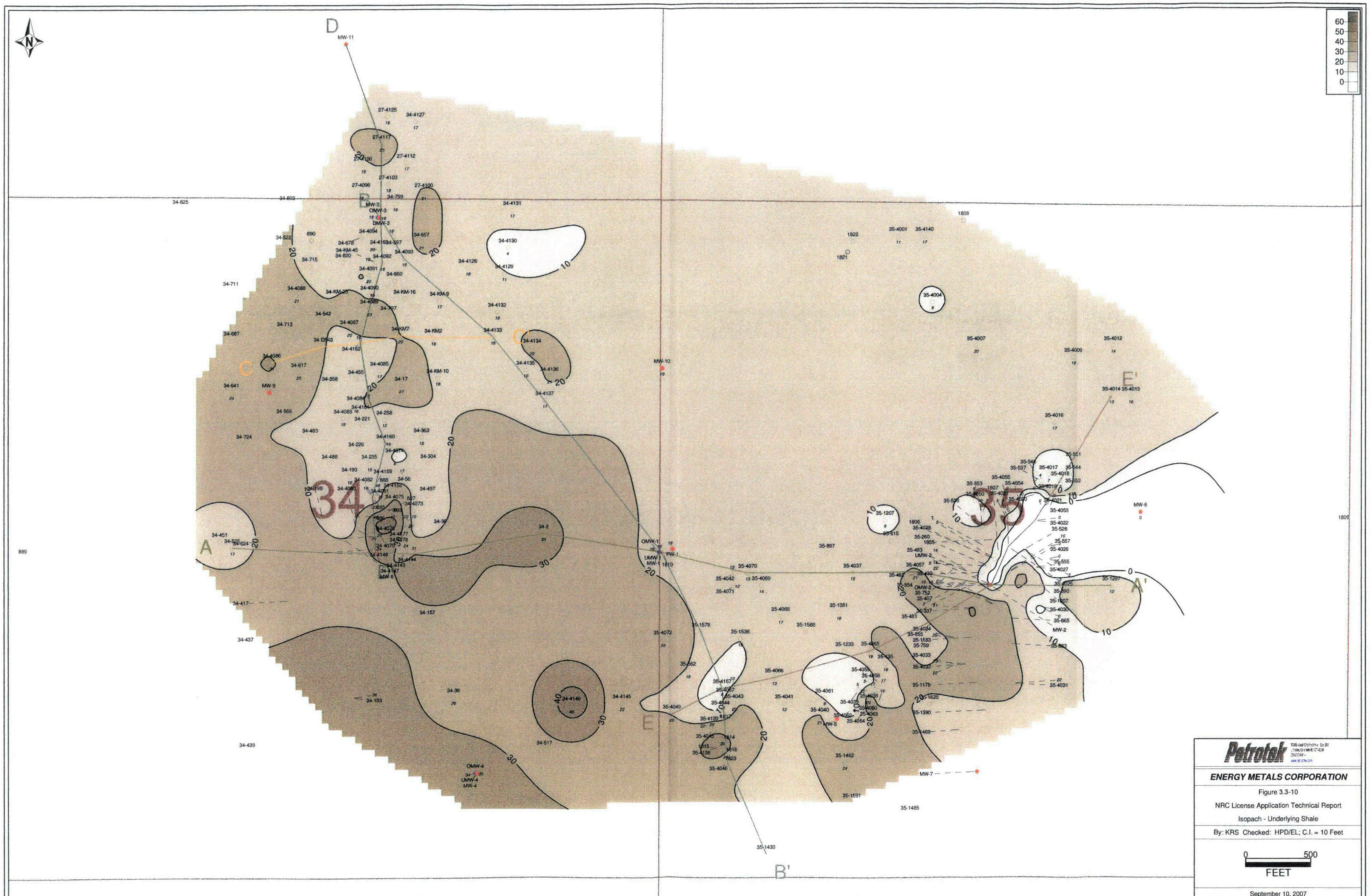
Isopach - Production Zone 70 Sand

By: KRS Checked: HPD/EL; C.I. = 10 Feet

0 500

FEET

September 7, 2007



Petrotek

ENERGY METALS CORPORATION

Figure 3.3-10

NRC License Application Technical Report

Isopach - Underlying Shale

By: KRS Checked: HPD/EL; C.I. = 10 Feet

0 500
FEET

September 10, 2007

Section 3.3-4 (Table and Figure)

Table 3.3-1 Moore Ranch Drill Holes

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	27	4275-27-4096	317808.9	1060745	398.9
42	75	27	4275-27-4097	317894.2	1060732	395.5
42	75	27	4275-27-4098	317994.8	1060709	395
42	75	27	4275-27-4099	318094.3	1060707	393.9
42	75	27	4275-27-4100	318288.9	1060745	393.8
42	75	27	4275-27-4101	318206.1	1060762	394.1
42	75	27	4275-27-4102	318107.9	1060783	394.5
42	75	27	4275-27-4103	318016.6	1060804	396.6
42	75	27	4275-27-4104	317910.4	1060827	396.7
42	75	27	4275-27-4105	317812.1	1060850	395.5
42	75	27	4275-27-4106	317824.2	1060950	397.8
42	75	27	4275-27-4107	317929.3	1060926	305.4
42	75	27	4275-27-4108	318033.4	1060903	398.2
42	75	27	4275-27-4109	318132.3	1060880	397.1
42	75	27	4275-27-4110	318227.6	1060858	395.1
42	75	27	4275-27-4111	318249	1060948	394.5
42	75	27	4275-27-4112	318152.8	1060973	395.9
42	75	27	4275-27-4113	318054.5	1060996	397.8
42	75	27	4275-27-4114	317947.8	1061022	398.4
42	75	27	4275-27-4115	317834.7	1061049	398.5
42	75	27	4275-27-4116	317849.2	1061148	397.8
42	75	27	4275-27-4117	317966.6	1061118	397.4
42	75	27	4275-27-4118	318077.2	1061091	397.7
42	75	27	4275-27-4119	318173.6	1061068	395.8
42	75	27	4275-27-4120	318271.7	1061043	398.7
42	75	27	4275-27-4121	318194.4	1061181	397.9
42	75	27	4275-27-4122	318101.2	1061203	395.5
42	75	27	4275-27-4123	317984.8	1061222	395.5
42	75	27	4275-27-4124	317860.8	1061243	395.7
42	75	27	4275-27-4125	318009	1061325	397.6
42	75	27	4275-27-4126	318127.3	1061304	398.3
42	75	27	4275-27-4127	318221.9	1061287	397.6
42	75	27	4275-27-4128	318626.5	1060160	799.1
42	75	27	4275-27-MW-11	317691.5	1061878	339.1
42	75	34	4275-34-1	320034	1058069	
42	75	34	4275-34-10	318118	1060346	
42	75	34	4275-34-100	317617	1058047	
42	75	34	4275-34-101	317730	1057650	
42	75	34	4275-34-102	317290	1057650	
42	75	34	4275-34-103	317740	1056850	
42	75	34	4275-34-104	317340	1056450	
42	75	34	4275-34-105	318930	1055850	
42	75	34	4275-34-106	318140	1056655	
42	75	34	4275-34-107	318140	1056450	

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	34	4275-34-108	317780	1055750	
42	75	34	4275-34-109	317730	1057250	
42	75	34	4275-34-11	318218	1060245	
42	75	34	4275-34-110	317340	1056650	
42	75	34	4275-34-111	314794	1059619	
42	75	34	4275-34-112	315189	1059996	
42	75	34	4275-34-113	315190	1059193	
42	75	34	4275-34-114	315600	1060427	
42	75	34	4275-34-115	315178	1058389	
42	75	34	4275-34-116	314802	1058414	
42	75	34	4275-34-117	318120	1057850	
42	75	34	4275-34-118	317919	1057847	
42	75	34	4275-34-119	317720	1057850	
42	75	34	4275-34-12	318218	1060144	
42	75	34	4275-34-120	317520	1057850	
42	75	34	4275-34-121	317520	1057450	
42	75	34	4275-34-122	318520	1057050	
42	75	34	4275-34-123	319920	1057050	
42	75	34	4275-34-124	319920	1057250	
42	75	34	4275-34-125	319720	1056850	
42	75	34	4275-34-126	319720	1056650	
42	75	34	4275-34-127	319120	1056650	
42	75	34	4275-34-128	318720	1056650	
42	75	34	4275-34-129	318520	1056250	
42	75	34	4275-34-13	318119	1060046	
42	75	34	4275-34-130	318920	1056250	
42	75	34	4275-34-131	319920	1056250	
42	75	34	4275-34-132	319520	1056050	
42	75	34	4275-34-133	319520	1055650	
42	75	34	4275-34-134	319920	1055650	
42	75	34	4275-34-135	319920	1055850	
42	75	34	4275-34-136	317320	1057850	
42	75	34	4275-34-137	318320	1057850	
42	75	34	4275-34-138	317920	1057650	
42	75	34	4275-34-139	319720	1056250	
42	75	34	4275-34-14	318018	1059947	
42	75	34	4275-34-140	319720	1056450	
42	75	34	4275-34-141	319820	1056850	
42	75	34	4275-34-142	319720	1057050	
42	75	34	4275-34-143	317520	1057650	
42	75	34	4275-34-144	319720	1055850	
42	75	34	4275-34-145	318520	1055850	
42	75	34	4275-34-146	319320	1056250	
42	75	34	4275-34-147	319120	1056450	

Table 3.3-1 Moore Ranch Drill Holes

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	34	4275-34-148	318920	1056450	
42	75	34	4275-34-149	318120	1057450	
42	75	34	4275-34-15	318020	1059547	
42	75	34	4275-34-150	317520	1057950	
42	75	34	4275-34-151	318520	1056050	
42	75	34	4275-34-152	318720	1056450	
42	75	34	4275-34-153	319120	1056250	
42	75	34	4275-34-154	319420	1056250	
42	75	34	4275-34-155	319320	1056350	
42	75	34	4275-34-156	319820	1056250	
42	75	34	4275-34-157	318320	1057450	
42	75	34	4275-34-158	318520	1057850	
42	75	34	4275-34-159	317620	1057950	
42	75	34	4275-34-16	318121	1059348	
42	75	34	4275-34-160	317420	1057950	
42	75	34	4275-34-161	317420	1057850	
42	75	34	4275-34-162	317620	1057850	
42	75	34	4275-34-163	317821	1056040	
42	75	34	4275-34-164	319220	1056250	
42	75	34	4275-34-165	319220	1056350	
42	75	34	4275-34-166	319420	1056350	
42	75	34	4275-34-167	317320	1057750	
42	75	34	4275-34-168	317408	1057743	
42	75	34	4275-34-169	317520	1057750	
42	75	34	4275-34-17	318117	1059246	
42	75	34	4275-34-170	319320	1056450	
42	75	34	4275-34-171	319120	1056350	
42	75	34	4275-34-172	319720	1056350	
42	75	34	4275-34-173	319920	1056150	
42	75	34	4275-34-174	317720	1057950	297.9241
42	75	34	4275-34-175	317392	1057648	
42	75	34	4275-34-176	317920	1060450	333.9829
42	75	34	4275-34-177	318020	1060346	338.9079
42	75	34	4275-34-178	318220	1060345	337.9614
42	75	34	4275-34-179	317722	1059843	
42	75	34	4275-34-18	318020	1059146	
42	75	34	4275-34-180	318019	1059744	255.8768
42	75	34	4275-34-181	317726	1059544	289.9805
42	75	34	4275-34-182	317819	1059246	289.9211
42	75	34	4275-34-183	317528	1058822	249.9024
42	75	34	4275-34-184	317529	1058743	249.8311
42	75	34	4275-34-185	317628	1058646	251.9526
42	75	34	4275-34-186	317820	1058646	249.9805
42	75	34	4275-34-187	317924	1058758	289.8895

Table 3.3-1 Moore Ranch Drill Holes

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	34	4275-34-188	318320	1058746	270.9107
42	75	34	4275-34-189	318219	1058545	271.9962
42	75	34	4275-34-19	317820	1059146	
42	75	34	4275-34-190	317721	1058550	251.9883
42	75	34	4275-34-191	317719	1058448	242.9763
42	75	34	4275-34-192	317618	1058342	230.964
42	75	34	4275-34-193	317619	1058241	233.9217
42	75	34	4275-34-194	318118	1058147	231.874
42	75	34	4275-34-195	317521	1058145	229.9859
42	75	34	4275-34-196	317508	1058052	211.931
42	75	34	4275-34-197	317816	1060543	329.9131
42	75	34	4275-34-198	317516	1058231	231.9776
42	75	34	4275-34-199	317522	1058347	249.9367
42	75	34	4275-34-2	319212	1058107	
42	75	34	4275-34-20	317720	1059146	
42	75	34	4275-34-200	317618	1058293	233.9
42	75	34	4275-34-201C	317621	1058896	271.9
42	75	34	4275-34-202C	317618	1059198	261.9
42	75	34	4275-34-203C	317720	1058296	254
42	75	34	4275-34-204C	317675	1058295	
42	75	34	4275-34-205C	317723	1059194	
42	75	34	4275-34-206C	317721	1058898	
42	75	34	4275-34-207C	317919	1059194	288.6
42	75	34	4275-34-208C	317819	1059196	270.9
42	75	34	4275-34-209C	317821	1058894	272.6
42	75	34	4275-34-21	317721	1059047	
42	75	34	4275-34-210C	317821	1058298	253
42	75	34	4275-34-211C	317919	1058896	269.9
42	75	34	4275-34-212C	318019	1058899	269.8
42	75	34	4275-34-213C	317921	1058297	252
42	75	34	4275-34-214C	318021	1058298	252
42	75	34	4275-34-215C	318121	1058295	245.8
42	75	34	4275-34-216C	318020	1059196	292
42	75	34	4275-34-217C	318222	1058299	252.9
42	75	34	4275-34-218	317870	1059195	277
42	75	34	4275-34-219	317771	1059196	248
42	75	34	4275-34-22	317622	1058945	
42	75	34	4275-34-220	317866	1058987	277.8
42	75	34	4275-34-221	317820	1058940	275
42	75	34	4275-34-222	317872	1058895	275
42	75	34	4275-34-223	317771	1058897	275
42	75	34	4275-34-224	317773	1058841	272.9
42	75	34	4275-34-225	317874	1058845	272.9
42	75	34	4275-34-226	317773	1058743	275

Table 3.3-1 Moore Ranch Drill Holes

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	34	4275-34-227	317876	1058750	277.9
42	75	34	4275-34-228	317751	1058794	277.9
42	75	34	4275-34-229	317823	1058795	277
42	75	34	4275-34-23	317720	1058846	
42	75	34	4275-34-230	317874	1058799	273
42	75	34	4275-34-231	317823	1058696	276.9
42	75	34	4275-34-232	317721	1058698	274
42	75	34	4275-34-233	317922	1058697	274.9
42	75	34	4275-34-234	317771	1058646	254
42	75	34	4275-34-235	317874	1058648	231.3
42	75	34	4275-34-236	317973	1058646	274.9
42	75	34	4275-34-237	317522	1058644	254.8
42	75	34	4275-34-238	317429	1058739	254.9
42	75	34	4275-34-239	317924	1058597	272.9
42	75	34	4275-34-24	317821	1058846	
42	75	34	4275-34-240	317770	1058549	253.9
42	75	34	4275-34-241	317717	1058496	259
42	75	34	4275-34-242	317612	1058447	257
42	75	34	4275-34-243	318071	1058546	276.9
42	75	34	4275-34-244	318123	1058598	273.9
42	75	34	4275-34-245	318120	1058498	274.8
42	75	34	4275-34-246	318168	1058447	273.9
42	75	34	4275-34-247	317967	1058446	270.6
42	75	34	4275-34-248	318118	1058341	293.7
42	75	34	4275-34-249	318070	1058389	273.9
42	75	34	4275-34-25	317920	1058846	
42	75	34	4275-34-250	318071	1058245	254.9
42	75	34	4275-34-251	318221	1058149	234.9
42	75	34	4275-34-252	318117	1058095	177
42	75	34	4275-34-253	317920	1058095	236.9
42	75	34	4275-34-254	317714	1058094	237
42	75	34	4275-34-255	317615	1058095	235.9
42	75	34	4275-34-256	317615	1059097	276
42	75	34	4275-34-257	317872	1058943	275.8
42	75	34	4275-34-258	317988	1058986	271
42	75	34	4275-34-259	317971	1059048	275
42	75	34	4275-34-26	318019	1058848	
42	75	34	4275-34-260	317926	1059097	272
42	75	34	4275-34-261	317775	1059048	275.4
42	75	34	4275-34-262	317670	1059043	274.9
42	75	34	4275-34-263	317772	1058944	250.5
42	75	34	4275-34-264	317723	1058947	274.9
42	75	34	4275-34-265	317672	1058950	270
42	75	34	4275-34-266	317969	1058897	274.9

Table 3.3-1 Moore Ranch Drill Holes

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	34	4275-34-267	317974	1058848	273
42	75	34	4275-34-268	318020	1058802	275.8
42	75	34	4275-34-269	317678	1058839	272.9
42	75	34	4275-34-27	318121	1058745	
42	75	34	4275-34-270	317724	1058787	275
42	75	34	4275-34-271	317871	1058547	252.9
42	75	34	4275-34-272	317721	1059297	273.9
42	75	34	4275-34-273	317821	1059293	273.2
42	75	34	4275-34-274	317971	1059196	266.8
42	75	34	4275-34-275	318020	1059246	213.9
42	75	34	4275-34-276	317520	1059150	275.9
42	75	34	4275-34-277	318120	1058795	296
42	75	34	4275-34-278	318172	1058647	272.9
42	75	34	4275-34-279	318173	1058600	245
42	75	34	4275-34-28	318120	1058647	
42	75	34	4275-34-280	318071	1058496	226.8
42	75	34	4275-34-281	318267	1058300	254
42	75	34	4275-34-282	318265	1058248	254
42	75	34	4275-34-283	318216	1058197	232.8
42	75	34	4275-34-284	318266	1058151	
42	75	34	4275-34-285	318118	1058046	234
42	75	34	4275-34-286	317969	1058096	234.9
42	75	34	4275-34-287	318069	1058089	231.4
42	75	34	4275-34-288	317865	1058095	235.7
42	75	34	4275-34-289	317760	1058094	232.8
42	75	34	4275-34-29	317920	1058647	
42	75	34	4275-34-290	317670	1059096	274
42	75	34	4275-34-291	317568	1058342	235
42	75	34	4275-34-292	317564	1058236	236
42	75	34	4275-34-293	317566	1058146	229.9
42	75	34	4275-34-294	317515	1058094	232
42	75	34	4275-34-295	317563	1058046	232
42	75	34	4275-34-296	317666	1059247	274.9
42	75	34	4275-34-297	317773	1058597	253.8
42	75	34	4275-34-298	317775	1058696	273
42	75	34	4275-34-299	317824	1058599	251.9
42	75	34	4275-34-3	319320	1057250	
42	75	34	4275-34-30	317921	1058547	
42	75	34	4275-34-300	317763	1058494	256
42	75	34	4275-34-301	318017	1058493	256
42	75	34	4275-34-302	318020	1058598	273.8
42	75	34	4275-34-303	318121	1058696	293.9
42	75	34	4275-34-304	318324	1058650	275.8
42	75	34	4275-34-305	318316	1058100	232.9

Table 3.3-1 Moore Ranch Drill Holes

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	34	4275-34-306	318015	1058046	232
42	75	34	4275-34-307	317464	1058047	236
42	75	34	4275-34-308	317672	1059300	274
42	75	34	4275-34-309	317519	1059246	277
42	75	34	4275-34-31	318020	1058546	
42	75	34	4275-34-310	317570	1059150	276
42	75	34	4275-34-311	317562	1059098	274.9
42	75	34	4275-34-312	317615	1058994	274
42	75	34	4275-34-313	317576	1058838	275
42	75	34	4275-34-314	317576	1058741	256
42	75	34	4275-34-315	317573	1058885	273.8
42	75	34	4275-34-316	317668	1058499	253
42	75	34	4275-34-317	317618	1058499	254
42	75	34	4275-34-318	317614	1058396	254.9
42	75	34	4275-34-319	317663	1058445	254.9
42	75	34	4275-34-32	317821	1058347	
42	75	34	4275-34-320	317559	1058448	257.9
42	75	34	4275-34-321	317766	1058048	254
42	75	34	4275-34-322	317869	1058046	232
42	75	34	4275-34-323	317969	1058049	200
42	75	34	4275-34-324	318070	1058047	234.9
42	75	34	4275-34-325	318169	1058096	
42	75	34	4275-34-326	318265	1058201	232.9
42	75	34	4275-34-327	318315	1058207	185.9
42	75	34	4275-34-328	318318	1058252	256.4
42	75	34	4275-34-329	318171	1058698	292.9
42	75	34	4275-34-33	317922	1058247	
42	75	34	4275-34-330	318170	1058746	293.9
42	75	34	4275-34-331	318069	1058749	294.8
42	75	34	4275-34-332	318071	1058797	294.8
42	75	34	4275-34-333	317969	1058801	274.7
42	75	34	4275-34-334	317972	1059098	275
42	75	34	4275-34-335	318069	1059245	293
42	75	34	4275-34-336	318068	1059349	294.7
42	75	34	4275-34-337	317525	1059305	295
42	75	34	4275-34-338	317568	1059197	275
42	75	34	4275-34-339	317564	1059045	274.9
42	75	34	4275-34-34	318022	1058248	
42	75	34	4275-34-340	317567	1058994	273.9
42	75	34	4275-34-341	317568	1058947	274.9
42	75	34	4275-34-342	317520	1058886	275
42	75	34	4275-34-343	317563	1058397	249.9
42	75	34	4275-34-344	317566	1058286	236.9
42	75	34	4275-34-345	317565	1058188	233.9

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	34	4275-34-346	317570	1058096	231.9
42	75	34	4275-34-347	318217	1058397	274.9
42	75	34	4275-34-348	318221	1058697	294.9
42	75	34	4275-34-349	318221	1058796	291.8
42	75	34	4275-34-35	318220	1058249	
42	75	34	4275-34-350	318175	1058795	293.8
42	75	34	4275-34-351	318014	1058195	250
42	75	34	4275-34-352	318267	1058099	
42	75	34	4275-34-353	317873	1058697	275
42	75	34	4275-34-354	318071	1059297	294.9
42	75	34	4275-34-355	317574	1059305	249.9
42	75	34	4275-34-356	317624	1059305	249.9
42	75	34	4275-34-357	317673	1059348	294.9
42	75	34	4275-34-358	317571	1059248	274.9
42	75	34	4275-34-359	317467	1059246	272
42	75	34	4275-34-36	318419	1058148	
42	75	34	4275-34-360	317472	1059155	275
42	75	34	4275-34-361	317468	1059202	250
42	75	34	4275-34-362	317519	1059199	274.9
42	75	34	4275-34-363	318272	1058848	294.9
42	75	34	4275-34-364	318221	1058847	291.9
42	75	34	4275-34-365	318169	1058847	294.8
42	75	34	4275-34-366	318270	1058799	293.9
42	75	34	4275-34-367	318280	1058747	294
42	75	34	4275-34-368	318117	1059297	295
42	75	34	4275-34-369	317966	1058946	274.9
42	75	34	4275-34-37	318120	1057250	
42	75	34	4275-34-370	317575	1059360	297.9
42	75	34	4275-34-371	317559	1059179	274.9
42	75	34	4275-34-372	317627	1059357	295
42	75	34	4275-34-373	318416	1057845	218
42	75	34	4275-34-374	318016	1057853	217
42	75	34	4275-34-375	317916	1057946	217.8
42	75	34	4275-34-376	317809	1057844	217
42	75	34	4275-34-377	317665	1057845	217.9
42	75	34	4275-34-378	317664	1057946	217
42	75	34	4275-34-379	317613	1058000	210.9
42	75	34	4275-34-38	318520	1056850	
42	75	34	4275-34-380	317709	1058001	215
42	75	34	4275-34-381	317760	1057996	218
42	75	34	4275-34-382	317466	1057997	217.9
42	75	34	4275-34-383	317723	1056452	
42	75	34	4275-34-384	317413	1058000	217.9
42	75	34	4275-34-385	317313	1057952	217.9

Table 3.3-1 Moore Ranch Drill Holes

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	34	4275-34-386	317212	1057841	213
42	75	34	4275-34-387	317200	1057750	217.9
42	75	34	4275-34-388	317183	1057641	218
42	75	34	4275-34-389	317155	1057545	218
42	75	34	4275-34-39	319520	1056850	
42	75	34	4275-34-390	317256	1057559	196.9
42	75	34	4275-34-391	317352	1057541	
42	75	34	4275-34-392	317469	1057645	216.9
42	75	34	4275-34-393	317605	1057734	216.9
42	75	34	4275-34-394	318521	1057450	218
42	75	34	4275-34-395	318416	1057252	218
42	75	34	4275-34-396	317900	1056840	
42	75	34	4275-34-397	317318	1058001	210.9
42	75	34	4275-34-398	317219	1057948	229.9
42	75	34	4275-34-399	317265	1057843	218.9
42	75	34	4275-34-4	319520	1056450	
42	75	34	4275-34-40	319720	1057250	
42	75	34	4275-34-400	317250	1057746	210.8
42	75	34	4275-34-401	317286	1057694	216.8
42	75	34	4275-34-402	317335	1057646	218
42	75	34	4275-34-403	317384	1057597	217
42	75	34	4275-34-404	317512	1057695	218
42	75	34	4275-34-405	317557	1057739	218.9
42	75	34	4275-34-406	317612	1057792	217.9
42	75	34	4275-34-407	317664	1057898	213.7
42	75	34	4275-34-4073	318216	1058300	397.4
42	75	34	4275-34-4074	318068.8	1058710	395.1
42	75	34	4275-34-4075	318069.8	1058354	397
42	75	34	4275-34-4076	318070.9	1058203	397.5
42	75	34	4275-34-4077	318170.9	1058203	397.5
42	75	34	4275-34-4078	318170.9	1058153	397.2
42	75	34	4275-34-4079	317920.9	1058203	396.3
42	75	34	4275-34-408	316956	1057535	187
42	75	34	4275-34-4080	317769.9	1058156	397.9
42	75	34	4275-34-4081	317872.6	1058306	397.1
42	75	34	4275-34-4082	317900.6	1058402	394.2
42	75	34	4275-34-4083	317669.9	1059006	398.4
42	75	34	4275-34-4084	317769.9	1059108	396.5
42	75	34	4275-34-4085	317949.9	1059373	397
42	75	34	4275-34-4086	317125.9	1059438	363.9
42	75	34	4275-34-4087	317719.4	1059698	396.2
42	75	34	4275-34-4088	317314.9	1059958	396.5
42	75	34	4275-34-4089	317873.8	1059855	396.6
42	75	34	4275-34-409	317240	1057696	215.9

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	34	4275-34-4090	317874.2	1059963	397.8
42	75	34	4275-34-4091	317867.3	1060110	397.9
42	75	34	4275-34-4092	317971.3	1060203	395.8
42	75	34	4275-34-4093	318136.9	1060235	398.9
42	75	34	4275-34-4094	317934.7	1060491	396.3
42	75	34	4275-34-4095	317809.6	1060749	397.7
42	75	34	4275-34-41	319920	1056850	
42	75	34	4275-34-410	317433	1057593	214
42	75	34	4275-34-411	317333	1057587	216.9
42	75	34	4275-34-412	317263	1057948	215
42	75	34	4275-34-4129	318905.6	1060121	805.7
42	75	34	4275-34-413	317316	1057897	214.9
42	75	34	4275-34-4130	318931.5	1060317	790.7
42	75	34	4275-34-4131	318966.2	1060607	802.5
42	75	34	4275-34-4132	318851.4	1059823	803.7
42	75	34	4275-34-4133	318818.8	1059631	802.1
42	75	34	4275-34-4134	319120.5	1059551	792.4
42	75	34	4275-34-4135	319070.9	1059380	794.3
42	75	34	4275-34-4136	319254.1	1059331	799.6
42	75	34	4275-34-4137	319217.7	1059146	791.8
42	75	34	4275-34-414	317262	1057894	217
42	75	34	4275-34-4143	318150.3	1057985	401.8
42	75	34	4275-34-4144	318234.9	1057967	402.2
42	75	34	4275-34-4145	319812.9	1056819	301.3
42	75	34	4275-34-4146	319426.7	1056804	303.1
42	75	34	4275-34-4147	317665.3	1058086	401.7
42	75	34	4275-34-4148	317507.7	1057981	401.6
42	75	34	4275-34-415	317254	1057797	213.9
42	75	34	4275-34-4158	317978.9	1058361	401.5
42	75	34	4275-34-4159	317918.6	1058498	405.4
42	75	34	4275-34-416	317230	1057643	214
42	75	34	4275-34-4160	317998.7	1058817	402.5
42	75	34	4275-34-4161	317876.3	1059140	402
42	75	34	4275-34-4162	317805.7	1059590	401.9
42	75	34	4275-34-4163	317947.5	1060311	400.9
42	75	34	4275-34-417	317269	1057596	211
42	75	34	4275-34-418	317304	1057541	196.9
42	75	34	4275-34-419	317426	1057539	195.9
42	75	34	4275-34-42	319920	1056450	
42	75	34	4275-34-420	317486	1057550	194.8
42	75	34	4275-34-421	317487	1057587	211
42	75	34	4275-34-422	317565	1057692	216
42	75	34	4275-34-423	317658	1057797	216
42	75	34	4275-34-424	317713	1057896	215.9

Table 3.3-1 Moore Ranch Drill Holes

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	34	4275-34-425	317768	1057945	
42	75	34	4275-34-426	317808	1057996	215.9
42	75	34	4275-34-427	317413	1058049	214
42	75	34	4275-34-428	317364	1058052	215
42	75	34	4275-34-429	317261	1058001	210.9
42	75	34	4275-34-43	318920	1057050	
42	75	34	4275-34-430	317362	1057995	214
42	75	34	4275-34-431	319321	1056051	
42	75	34	4275-34-432	319816	1056350	225.7
42	75	34	4275-34-433	319924	1056354	226
42	75	34	4275-34-434	320026	1056249	232.9
42	75	34	4275-34-435	319831	1056151	211.8
42	75	34	4275-34-436	316921	1057646	216
42	75	34	4275-34-437	316923	1057245	194.9
42	75	34	4275-34-438	316924	1056846	191.9
42	75	34	4275-34-439	316934	1056438	193
42	75	34	4275-34-44	318920	1056650	
42	75	34	4275-34-440	316925	1056047	172
42	75	34	4275-34-441	317322	1056048	163.9
42	75	34	4275-34-442	317326	1055449	167.8
42	75	34	4275-34-443	317730	1055451	171.7
42	75	34	4275-34-444	318122	1055447	173.8
42	75	34	4275-34-445	318520	1055450	173.9
42	75	34	4275-34-446	318921	1055449	177
42	75	34	4275-34-447	319518	1055449	195.8
42	75	34	4275-34-448	317323	1057246	191.9
42	75	34	4275-34-449	316522	1057647	215.9
42	75	34	4275-34-45	318520	1057650	
42	75	34	4275-34-450	317111	1058056	211.9
42	75	34	4275-34-451	316725	1058048	215
42	75	34	4275-34-452	318120	1059400	297.8
42	75	34	4275-34-453	318070	1059400	295.4
42	75	34	4275-34-454	318020	1059400	297.2
42	75	34	4275-34-455	317770	1059300	
42	75	34	4275-34-456	317870	1059300	297
42	75	34	4275-34-457	317770	1059350	299
42	75	34	4275-34-458	317520	1059350	297.9
42	75	34	4275-34-459	317520	1059000	277.9
42	75	34	4275-34-46	318120	1057650	
42	75	34	4275-34-460	317520	1058800	276.7
42	75	34	4275-34-461	317570	1058800	276.8
42	75	34	4275-34-462	317470	1058750	277
42	75	34	4275-34-463	317470	1058800	277
42	75	34	4275-34-464	317520	1058700	275.5

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	34	4275-34-465	317470	1058700	276.9
42	75	34	4275-34-466	317620	1058700	276
42	75	34	4275-34-467	317670	1058700	278
42	75	34	4275-34-468	317670	1058550	258
42	75	34	4275-34-469	317620	1058550	255.9
42	75	34	4275-34-47	317918	1060345	
42	75	34	4275-34-470	317470	1058100	236.9
42	75	34	4275-34-471	317820	1058050	234
42	75	34	4275-34-472	318070	1058850	274.9
42	75	34	4275-34-473	318170	1058550	274.9
42	75	34	4275-34-474	318170	1058450	277
42	75	34	4275-34-475	318170	1058400	275
42	75	34	4275-34-476	318270	1058350	276
42	75	34	4275-34-477	318270	1058400	276
42	75	34	4275-34-478	318270	1058450	275.9
42	75	34	4275-34-479	318320	1058300	274.9
42	75	34	4275-34-48	317619	1059044	
42	75	34	4275-34-480	318320	1058150	236
42	75	34	4275-34-481	318170	1058050	235
42	75	34	4275-34-482	317420	1058800	275.4
42	75	34	4275-34-483	317420	1058850	277.8
42	75	34	4275-34-484	317470	1058850	272.7
42	75	34	4275-34-485	317420	1058700	273.9
42	75	34	4275-34-486	317420	1058650	276.9
42	75	34	4275-34-487	317470	1058650	275.9
42	75	34	4275-34-488	317570	1058650	274.8
42	75	34	4275-34-489	317670	1058650	274.9
42	75	34	4275-34-49	317520	1058945	
42	75	34	4275-34-490	317670	1058600	276.9
42	75	34	4275-34-491	317633	1058593	275.9
42	75	34	4275-34-492	317720	1058600	275.9
42	75	34	4275-34-493	318224	1058494	255.5
42	75	34	4275-34-494	318273	1058502	256.6
42	75	34	4275-34-495	318320	1058500	255.9
42	75	34	4275-34-496	318320	1058450	256.9
42	75	34	4275-34-497	318320	1058400	257.9
42	75	34	4275-34-498	317570	1058600	277.8
42	75	34	4275-34-499	317520	1058600	276.9
42	75	34	4275-34-5	318520	1057250	
42	75	34	4275-34-50	317633	1058835	
42	75	34	4275-34-500	317570	1058550	277.9
42	75	34	4275-34-501	317620	1058850	276.7
42	75	34	4275-34-502	317620	1058650	275.9
42	75	34	4275-34-503	317221	1058496	272.7

Table 3.3-1 Moore Ranch Drill Holes

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	34	4275-34-504	317421	1058497	276.7
42	75	34	4275-34-505	317417	1058295	275
42	75	34	4275-34-506	317520	1058550	249.8
42	75	34	4275-34-507	317520	1058500	255
42	75	34	4275-34-508	317570	1058500	255.8
42	75	34	4275-34-509	317223	1059094	275.6
42	75	34	4275-34-51	318120	1058848	
42	75	34	4275-34-510	317420	1058900	275.6
42	75	34	4275-34-511	317470	1058900	275.7
42	75	34	4275-34-512	318320	1056050	
42	75	34	4275-34-513	319720	1056050	
42	75	34	4275-34-514	319120	1055850	
42	75	34	4275-34-515	319320	1055850	
42	75	34	4275-34-516	318720	1056850	
42	75	34	4275-34-517	319220	1056450	
42	75	34	4275-34-518	319420	1056450	
42	75	34	4275-34-519	319520	1056550	
42	75	34	4275-34-52	318221	1058747	
42	75	34	4275-34-520	320020	1056150	
42	75	34	4275-34-521	317220	1059600	
42	75	34	4275-34-522	317216	1060338	
42	75	34	4275-34-523	316420	1059600	
42	75	34	4275-34-524	316420	1058800	
42	75	34	4275-34-525	316420	1058000	
42	75	34	4275-34-526	316820	1057800	
42	75	34	4275-34-527	316420	1057200	
42	75	34	4275-34-528	315620	1058800	
42	75	34	4275-34-529	315620	1058400	
42	75	34	4275-34-53	317823	1058747	
42	75	34	4275-34-530	318370	1058800	
42	75	34	4275-34-531	315620	1056800	
42	75	34	4275-34-532	315620	1057600	
42	75	34	4275-34-533	315620	1060000	
42	75	34	4275-34-534	315620	1059200	
42	75	34	4275-34-535	317820	1060350	
42	75	34	4275-34-536	317820	1060150	
42	75	34	4275-34-537	317820	1059950	
42	75	34	4275-34-538	318020	1060050	
42	75	34	4275-34-539	317920	1060050	
42	75	34	4275-34-54	317720	1058746	
42	75	34	4275-34-540	317920	1059850	
42	75	34	4275-34-541	317720	1059950	
42	75	34	4275-34-542	317520	1059750	
42	75	34	4275-34-543	317520	1059550	

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	34	4275-34-544	317620	1059450	
42	75	34	4275-34-545	316420	1060400	
42	75	34	4275-34-546	317220	1058800	
42	75	34	4275-34-547	317820	1057650	
42	75	34	4275-34-548	317970	1060100	
42	75	34	4275-34-549	317720	1060350	
42	75	34	4275-34-55	318221	1058648	
42	75	34	4275-34-550	317920	1059950	
42	75	34	4275-34-551	318020	1059850	
42	75	34	4275-34-552	317520	1059650	
42	75	34	4275-34-553	317420	1059550	
42	75	34	4275-34-554	317420	1059700	
42	75	34	4275-34-555	317420	1059400	
42	75	34	4275-34-556	317320	1059600	
42	75	34	4275-34-557	317320	1059450	
42	75	34	4275-34-558	317370	1057900	
42	75	34	4275-34-559C	317470	1057900	
42	75	34	4275-34-56	318120	1058548	
42	75	34	4275-34-560C	317576	1057895	
42	75	34	4275-34-561	316920	1058050	
42	75	34	4275-34-562	316420	1057800	
42	75	34	4275-34-563	317020	1057800	
42	75	34	4275-34-564	316880	1057700	
42	75	34	4275-34-565	317220	1058600	
42	75	34	4275-34-566	317220	1059000	
42	75	34	4275-34-567	315620	1058800	
42	75	34	4275-34-568	318920	1056150	
42	75	34	4275-34-569	317920	1056050	
42	75	34	4275-34-57	318020	1058446	
42	75	34	4275-34-570	317470	1059550	
42	75	34	4275-34-571	317520	1059600	
42	75	34	4275-34-572	317270	1059600	
42	75	34	4275-34-573	317620	1059750	
42	75	34	4275-34-574	317770	1059850	
42	75	34	4275-34-575	317970	1059950	
42	75	34	4275-34-576	317970	1060050	
42	75	34	4275-34-577	317920	1060150	
42	75	34	4275-34-578	318071	1060991	
42	75	34	4275-34-579	318020	1060150	
42	75	34	4275-34-58	317921	1058446	
42	75	34	4275-34-580	317770	1060050	
42	75	34	4275-34-581	317620	1059650	
42	75	34	4275-34-582	317620	1059550	
42	75	34	4275-34-583	317720	1059650	

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	34	4275-34-584	317320	1058450	
42	75	34	4275-34-585	316824	1057741	
42	75	34	4275-34-586	317970	1060150	
42	75	34	4275-34-587	317770	1060100	
42	75	34	4275-34-588	317770	1060000	
42	75	34	4275-34-589	317720	1060050	
42	75	34	4275-34-59	317821	1058448	
42	75	34	4275-34-590	317670	1059750	
42	75	34	4275-34-591	317670	1059650	
42	75	34	4275-34-592	317470	1059600	
42	75	34	4275-34-593	317420	1059500	
42	75	34	4275-34-594	317870	1060150	
42	75	34	4275-34-595	317870	1060400	
42	75	34	4275-34-596	317964	1060394	
42	75	34	4275-34-597	318508	1060394	
42	75	34	4275-34-598	318170	1060400	
42	75	34	4275-34-599	317870	1060300	
42	75	34	4275-34-6	318019	1060645	
42	75	34	4275-34-60	317721	1058347	
42	75	34	4275-34-600	317971	1060293	
42	75	34	4275-34-601	318070	1060296	
42	75	34	4275-34-602	318177	1060304	
42	75	34	4275-34-603	317857	1060488	
42	75	34	4275-34-604	317720	1059800	
42	75	34	4275-34-605	317820	1059900	
42	75	34	4275-34-606	317920	1060000	
42	75	34	4275-34-607	318120	1060150	
42	75	34	4275-34-608	317720	1060450	
42	75	34	4275-34-609	317770	1060150	
42	75	34	4275-34-61	317821	1058249	
42	75	34	4275-34-610	317720	1060100	
42	75	34	4275-34-611	317820	1060100	
42	75	34	4275-34-612	317870	1060050	
42	75	34	4275-34-613	317620	1059600	
42	75	34	4275-34-614	317520	1059450	
42	75	34	4275-34-615	317670	1059800	
42	75	34	4275-34-616	317870	1060200	
42	75	34	4275-34-617	317320	1059350	
42	75	34	4275-34-618	317220	1059450	
42	75	34	4275-34-619	317220	1058300	
42	75	34	4275-34-62	317922	1058147	
42	75	34	4275-34-626	317220	1060000	
42	75	34	4275-34-627C	317870	1058600	
42	75	34	4275-34-628C	317970	1058600	

Table 3.3-1 Moore Ranch Drill Holes

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	34	4275-34-629C	318070	1058600	
42	75	34	4275-34-63	318320	1057650	
42	75	34	4275-34-631	317222	1057895	
42	75	34	4275-34-632	317210	1057794	
42	75	34	4275-34-633	317642	1057969	
42	75	34	4275-34-634	317568	1057653	
42	75	34	4275-34-635	317546	1057596	
42	75	34	4275-34-636	317543	1057553	
42	75	34	4275-34-637	317566	1057842	
42	75	34	4275-34-638	317774	1057884	
42	75	34	4275-34-639	317774	1057884	
42	75	34	4275-34-64	318320	1057250	
42	75	34	4275-34-640	317120	1059600	
42	75	34	4275-34-641	316820	1059200	
42	75	34	4275-34-642	317220	1059050	
42	75	34	4275-34-643	317220	1058650	
42	75	34	4275-34-644	317820	1060500	
42	75	34	4275-34-645	317870	1060550	
42	75	34	4275-34-646	318170	1060500	
42	75	34	4275-34-647	318120	1060550	
42	75	34	4275-34-648	317771	1060197	
42	75	34	4275-34-649	317664	1059845	
42	75	34	4275-34-65	318720	1057050	
42	75	34	4275-34-650	317667	1059691	
42	75	34	4275-34-651	317717	1059999	
42	75	34	4275-34-652	317915	1059750	
42	75	34	4275-34-653	318025	1060553	
42	75	34	4275-34-654	317716	1060145	
42	75	34	4275-34-655	318199	1060406	
42	75	34	4275-34-656	318168	1060452	
42	75	34	4275-34-657	318271	1060353	
42	75	34	4275-34-658	318239	1060307	
42	75	34	4275-34-659	318021	1060101	
42	75	34	4275-34-66	319920	1056650	
42	75	34	4275-34-660	318065	1060053	
42	75	34	4275-34-661	317966	1059853	
42	75	34	4275-34-662	317974	1059900	
42	75	34	4275-34-663	317819	1059794	
42	75	34	4275-34-664	317776	1059741	
42	75	34	4275-34-665	317761	1060437	
42	75	34	4275-34-666	317218	1058548	
42	75	34	4275-34-667	317020	1057844	
42	75	34	4275-34-668	317174	1057841	
42	75	34	4275-34-669	317170	1057896	

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	34	4275-34-67	319520	1056650	
42	75	34	4275-34-670	317165	1057948	
42	75	34	4275-34-671	317570	1057997	
42	75	34	4275-34-672	317510	1057790	
42	75	34	4275-34-673	316427	1057850	
42	75	34	4275-34-674	318076	1060554	
42	75	34	4275-34-675	317972	1060548	
42	75	34	4275-34-676	317918	1060548	
42	75	34	4275-34-677	317761	1060344	
42	75	34	4275-34-678	317814	1060390	
42	75	34	4275-34-679	317905	1060395	
42	75	34	4275-34-68	319320	1056650	
42	75	34	4275-34-680	318018	1060000	
42	75	34	4275-34-681	317318	1058303	
42	75	34	4275-34-682	317976	1060594	
42	75	34	4275-34-683	317765	1059644	
42	75	34	4275-34-684	317717	1059589	
42	75	34	4275-34-685	317112	1059693	
42	75	34	4275-34-686	317122	1059501	
42	75	34	4275-34-687	316816	1059596	
42	75	34	4275-34-688	317171	1057795	
42	75	34	4275-34-689	317123	1057793	
42	75	34	4275-34-69	318920	1056850	
42	75	34	4275-34-690	317120	1057841	
42	75	34	4275-34-691	317116	1057894	
42	75	34	4275-34-692	315600	1058600	
42	75	34	4275-34-693	317212	1060143	
42	75	34	4275-34-694	317220	1059747	
42	75	34	4275-34-695	317566	1059494	
42	75	34	4275-34-696	317023	1058700	
42	75	34	4275-34-697	316920	1057743	
42	75	34	4275-34-698	316637	1057692	
42	75	34	4275-34-699C	317644	1058545	
42	75	34	4275-34-7	318119	1060646	
42	75	34	4275-34-70	317914	1060650	
42	75	34	4275-34-700	317130	1059393	
42	75	34	4275-34-701	317027	1059490	
42	75	34	4275-34-702	317012	1059597	
42	75	34	4275-34-703	317474	1059496	
42	75	34	4275-34-704	317379	1059404	
42	75	34	4275-34-705	316481	1057796	
42	75	34	4275-34-706	316376	1057803	
42	75	34	4275-34-707	317034	1059385	
42	75	34	4275-34-708	317135	1059294	

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	34	4275-34-709	317215	1060048	
42	75	34	4275-34-71	317819	1060444	
42	75	34	4275-34-710	316797	1060368	
42	75	34	4275-34-711	316809	1059979	
42	75	34	4275-34-712	317112	1059644	
42	75	34	4275-34-713	317224	1059670	
42	75	34	4275-34-714	317370	1059457	
42	75	34	4275-34-715	317417	1060167	
42	75	34	4275-34-716	316917	1058700	
42	75	34	4275-34-717	317015	1058801	
42	75	34	4275-34-718	317029	1058604	
42	75	34	4275-34-719C	317528	1058762	
42	75	34	4275-34-72	317823	1060045	
42	75	34	4275-34-720	317694	1057897	
42	75	34	4275-34-721	316986	1059383	
42	75	34	4275-34-722	317040	1059287	
42	75	34	4275-34-723	317418	1059600	
42	75	34	4275-34-724	316912	1058802	
42	75	34	4275-34-725	316815	1058709	
42	75	34	4275-34-726	316914	1058607	
42	75	34	4275-34-727	317125	1059557	
42	75	34	4275-34-728	317216	1059842	
42	75	34	4275-34-729	317311	1059789	
42	75	34	4275-34-73	317824	1059844	
42	75	34	4275-34-730	317325	1059690	
42	75	34	4275-34-731	317069	1059600	
42	75	34	4275-34-732	317169	1059602	
42	75	34	4275-34-733	317762	1060506	
42	75	34	4275-34-734	317760	1060392	
42	75	34	4275-34-735	317713	1060286	
42	75	34	4275-34-736	317706	1060172	
42	75	34	4275-34-737	318179	1060205	
42	75	34	4275-34-738	318176	1060254	
42	75	34	4275-34-739	318277	1060305	
42	75	34	4275-34-74	317923	1059445	
42	75	34	4275-34-740	318260	1060408	
42	75	34	4275-34-741	318215	1060454	
42	75	34	4275-34-742	318181	1060563	
42	75	34	4275-34-743	318027	1060600	
42	75	34	4275-34-744	317923	1060587	
42	75	34	4275-34-745	317977	1060642	
42	75	34	4275-34-746	318069	1060110	
42	75	34	4275-34-747	318064	1060005	
42	75	34	4275-34-748	318063	1059956	

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	34	4275-34-749	318016	1059898	
42	75	34	4275-34-75	317720	1059247	
42	75	34	4275-34-750	317967	1059799	
42	75	34	4275-34-751	317921	1059797	
42	75	34	4275-34-752	317862	1059747	
42	75	34	4275-34-753	317816	1059696	
42	75	34	4275-34-754	317815	1059645	
42	75	34	4275-34-755	317760	1059585	
42	75	34	4275-34-756	317666	1059593	
42	75	34	4275-34-757	317569	1059544	
42	75	34	4275-34-758	316992	1059283	
42	75	34	4275-34-759	317046	1059188	
42	75	34	4275-34-76	317619	1059147	
42	75	34	4275-34-760	316929	1059193	
42	75	34	4275-34-761	317610	1059690	
42	75	34	4275-34-762	317465	1059648	
42	75	34	4275-34-763	317662	1059896	
42	75	34	4275-34-764	318070	1060155	
42	75	34	4275-34-765	318113	1060056	
42	75	34	4275-34-766	317519	1059497	
42	75	34	4275-34-767	317171	1059503	
42	75	34	4275-34-768	317031	1059436	
42	75	34	4275-34-769	317088	1059290	
42	75	34	4275-34-77	317822	1059047	
42	75	34	4275-34-770	317079	1059549	
42	75	34	4275-34-771	317166	1059680	
42	75	34	4275-34-772	317276	1059681	
42	75	34	4275-34-773	317071	1059500	
42	75	34	4275-34-774	317131	1059348	
42	75	34	4275-34-775	317182	1059396	
42	75	34	4275-34-776	317046	1059236	
42	75	34	4275-34-777	316982	1059189	
42	75	34	4275-34-778	317315	1059900	
42	75	34	4275-34-779	317176	1059546	
42	75	34	4275-34-78	317921	1059047	
42	75	34	4275-34-780	317414	1060103	
42	75	34	4275-34-781	317323	1060101	
42	75	34	4275-34-782	317422	1060300	
42	75	34	4275-34-783	317319	1060157	
42	75	34	4275-34-784	317657	1059948	
42	75	34	4275-34-785	317763	1060289	
42	75	34	4275-34-786	317716	1060244	
42	75	34	4275-34-787	317719	1059901	
42	75	34	4275-34-788	317865	1059699	

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	34	4275-34-789	317467	1059448	
42	75	34	4275-34-79	317626	1058746	
42	75	34	4275-34-790	316964	1058802	
42	75	34	4275-34-791	316974	1058700	
42	75	34	4275-34-792	316812	1058609	
42	75	34	4275-34-793	316823	1060625	
42	75	34	4275-34-794	317270	1059751	
42	75	34	4275-34-795	317162	1059740	
42	75	34	4275-34-796	317970	1059746	
42	75	34	4275-34-797	318020	1059789	
42	75	34	4275-34-798	317756	1059535	
42	75	34	4275-34-799	318070	1060647	
42	75	34	4275-34-8	318018	1060446	
42	75	34	4275-34-80	317723	1058648	
42	75	34	4275-34-800	317869	1060580	
42	75	34	4275-34-801	317449	1060642	
42	75	34	4275-34-802	317646	1060652	
42	75	34	4275-34-803	317244	1060639	
42	75	34	4275-34-804	317711	1060389	
42	75	34	4275-34-805	317369	1060162	
42	75	34	4275-34-806	317425	1060344	
42	75	34	4275-34-807	317818	1060573	
42	75	34	4275-34-808	317350	1060639	
42	75	34	4275-34-809	317323	1060297	
42	75	34	4275-34-81	317822	1058549	
42	75	34	4275-34-810	317322	1060000	
42	75	34	4275-34-811	317268	1059900	
42	75	34	4275-34-812	317216	1059504	
42	75	34	4275-34-813	317083	1059340	
42	75	34	4275-34-814	317076	1059433	
42	75	34	4275-34-815	316980	1059093	
42	75	34	4275-34-816	316873	1059099	
42	75	34	4275-34-817	318220	1060500	
42	75	34	4275-34-818	317764	1060241	
42	75	34	4275-34-819	317816	1060288	
42	75	34	4275-34-82	318120	1058550	
42	75	34	4275-34-820	317672	1060197	
42	75	34	4275-34-821	317447	1060496	
42	75	34	4275-34-822	317110	1059735	
42	75	34	4275-34-823	317548	1060646	
42	75	34	4275-34-824	317045	1060638	
42	75	34	4275-34-825	316425	1060609	
42	75	34	4275-34-826	317372	1060103	
42	75	34	4275-34-827	317414	1060007	

Table 3.3-1 Moore Ranch Drill Holes

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	34	4275-34-828	317267	1059805	
42	75	34	4275-34-829	317113	1058798	
42	75	34	4275-34-83	318220	1058450	
42	75	34	4275-34-830	317026	1058655	
42	75	34	4275-34-831	317573	1059450	
42	75	34	4275-34-832	317771	1059442	
42	75	34	4275-34-833	317667	1059545	
42	75	34	4275-34-834	318057	1059632	
42	75	34	4275-34-835	317349	1060498	
42	75	34	4275-34-836	317545	1060499	
42	75	34	4275-34-837	317366	1060004	
42	75	34	4275-34-838	317216	1059899	
42	75	34	4275-34-839	317103	1059576	
42	75	34	4275-34-84	318220	1058350	
42	75	34	4275-34-840	316422	1058397	
42	75	34	4275-34-841	317130	1059415	
42	75	34	4275-34-842	317035	1059342	
42	75	34	4275-34-843	317818	1060621	
42	75	34	4275-34-844	317870	1060631	
42	75	34	4275-34-845	317767	1060573	
42	75	34	4275-34-846	317376	1060301	
42	75	34	4275-34-847	317466	1060168	
42	75	34	4275-34-848	317565	1060103	
42	75	34	4275-34-849	317363	1059900	
42	75	34	4275-34-85	318121	1058246	
42	75	34	4275-34-850	317465	1059843	
42	75	34	4275-34-851	316434	1059929	
42	75	34	4275-34-852	316826	1058310	
42	75	34	4275-34-853	317393	1060498	
42	75	34	4275-34-854	317291	1060500	
42	75	34	4275-34-855	316927	1059094	
42	75	34	4275-34-856	317656	1059580	
42	75	34	4275-34-857	317566	1060297	
42	75	34	4275-34-858	317497	1060643	
42	75	34	4275-34-859	317661	1060431	
42	75	34	4275-34-86	317720	1058244	
42	75	34	4275-34-860	317870	1059446	
42	75	34	4275-34-861	317874	1059537	
42	75	34	4275-34-862	318372	1057853	
42	75	34	4275-34-863	318474	1057851	
42	75	34	4275-34-864	318025	1057649	
42	75	34	4275-34-865	317870	1057996	
42	75	34	4275-34-866	316931	1059145	
42	75	34	4275-34-867	316982	1059143	

Table [illegible] Moore Ranch Drill Holes

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	34	4275-34-868	317034	1059141	
42	75	34	4275-34-869	317371	1060210	
42	75	34	4275-34-87	317719	1058147	
42	75	34	4275-34-870	317420	1060216	
42	75	34	4275-34-871	317609	1060427	
42	75	34	4275-34-872	317393	1060641	
42	75	34	4275-34-873	317272	1060014	
42	75	34	4275-34-874	316894	1058948	
42	75	34	4275-34-875	319026	1056808	
42	75	34	4275-34-876C	317080	1059388	
42	75	34	4275-34-877C	317219	1059710	
42	75	34	4275-34-878	316789	1058969	
42	75	34	4275-34-879	316839	1058959	
42	75	34	4275-34-88	317820	1058147	
42	75	34	4275-34-880	316695	1058985	
42	75	34	4275-34-881C	317770	1059700	
42	75	34	4275-34-882C	317920	1060100	
42	75	34	4275-34-883	317870	1060450	
42	75	34	4275-34-884C	318070	1060450	
42	75	34	4275-34-885	317969	1058448	
42	75	34	4275-34-886	317968	1058383	
42	75	34	4275-34-887	317823	1058399	
42	75	34	4275-34-888	317872	1058493	
42	75	34	4275-34-89	318023	1058146	
42	75	34	4275-34-891C	317774.9	1059106	
42	75	34	4275-34-892C	317767.7	1058212	
42	75	34	4275-34-893	317842	1058421	
42	75	34	4275-34-894C	317768	1058202	
42	75	34	4275-34-9	318118	1060446	
42	75	34	4275-34-90	317922	1058047	
42	75	34	4275-34-91	319920	1056050	
42	75	34	4275-34-92	317822	1060247	
42	75	34	4275-34-93	317823	1059744	
42	75	34	4275-34-94	317728	1059743	
42	75	34	4275-34-95	317721	1059346	
42	75	34	4275-34-96	317617	1059247	
42	75	34	4275-34-97	318020	1059045	
42	75	34	4275-34-98	317621	1058146	
42	75	34	4275-34-99	317719	1058047	
42	75	34	4275-34-KM1	315656	1059616	
42	75	34	4275-34-KM10	318397	1059305	
42	75	34	4275-34-KM11	315751	1060701	
42	75	34	4275-34-KM12	318003	1059631	
42	75	34	4275-34-KM13	317895	1059630	

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	34	4275-34-KM14	318209	1059309	
42	75	34	4275-34-KM15	317997	1059308	
42	75	34	4275-34-KM16	318141	1059915	
42	75	34	4275-34-KM17	317853	1059917	
42	75	34	4275-34-KM18	317723	1060509	
42	75	34	4275-34-KM19	317588	1058713	
42	75	34	4275-34-KM2	318362	1059614	
42	75	34	4275-34-KM20	318030	1058708	
42	75	34	4275-34-KM21	318000	1059363	
42	75	34	4275-34-KM22	317949	1059315	
42	75	34	4275-34-KM23	317995	1059260	
42	75	34	4275-34-KM24	318133	1060515	
42	75	34	4275-34-KM25	317624	1059919	
42	75	34	4275-34-KM26	317950	1059266	
42	75	34	4275-34-KM27	318035	1060514	
42	75	34	4275-34-KM28	318027	1058762	
42	75	34	4275-34-KM29	317979	1058711	
42	75	34	4275-34-KM3	316030	1059399	
42	75	34	4275-34-KM30	318040	1058657	
42	75	34	4275-34-KM31	317893	1059262	
42	75	34	4275-34-KM32	317951	1059163	
42	75	34	4275-34-KM33	318086	1060514	
42	75	34	4275-34-KM34	317811	1058984	
42	75	34	4275-34-KM35	318016	1058992	
42	75	34	4275-34-KM36	317915	1058984	
42	75	34	4275-34-KM37	318123	1058385	
42	75	34	4275-34-KM38	318020	1058387	
42	75	34	4275-34-KM39	317920	1058385	
42	75	34	4275-34-KM4	316616	1059376	
42	75	34	4275-34-KM40	318207	1058107	
42	75	34	4275-34-KM41	318020	1058097	
42	75	34	4275-34-KM42	317816	1058083	
42	75	34	4275-34-KM43	318127	1060203	
42	75	34	4275-34-KM44	318037	1060199	
42	75	34	4275-34-KM45	317924	1060196	
42	75	34	4275-34-KM46	318077	1060604	
42	75	34	4275-34-KM47	317981	1060514	
42	75	34	4275-34-KM48	317715	1058982	
42	75	34	4275-34-KM5	317226	1059320	
42	75	34	4275-34-KM6	317808	1059350	
42	75	34	4275-34-KM7	318110	1059631	
42	75	34	4275-34-KM8	318732	1059583	
42	75	34	4275-34-KM9	318408	1059897	
42	75	34	4275-34-MW-3	317949.4	1060552	317.8

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	34	4275-34-MW-4	318698.6	1056282	218.5
42	75	34	4275-34-MW-8	317924.6	1057973	218.5
42	75	34	4275-34-MW-9	317101.6	1059208	276.7
42	75	34	4275-34-OMW-3	317939.3	1060553	248.6
42	75	34	4275-34-OMW-4	318688.7	1056283	119.5
42	75	34	4275-34-UMW-3	317959.6	1060551	378.9
42	75	34	4275-34-UMW-4	318709.4	1056283	297.9
42	75	35	4275-35-1	322665	1058014	
42	75	35	4275-35-10	320529	1059248	
42	75	35	4275-35-100	323322	1058451	
42	75	35	4275-35-1000	320460	1056497	236
42	75	35	4275-35-1001	320576	1056501	235.9
42	75	35	4275-35-1002	320672	1056602	234.9
42	75	35	4275-35-1003	320770	1056705	233.9
42	75	35	4275-35-1004	320572	1056846	235
42	75	35	4275-35-1005	321025	1057149	235.9
42	75	35	4275-35-1006	322968	1057205	216
42	75	35	4275-35-1007	323027	1057701	235.8
42	75	35	4275-35-1008	323074	1057749	256.9
42	75	35	4275-35-1009	322613	1057099	193.9
42	75	35	4275-35-101	323124	1058656	
42	75	35	4275-35-1010	322654	1057058	188
42	75	35	4275-35-1011	322706	1057056	190
42	75	35	4275-35-1012	322758	1057057	192
42	75	35	4275-35-1013	322808	1057060	191
42	75	35	4275-35-1014	320411	1056601	236.9
42	75	35	4275-35-1015	322607	1057051	199.9
42	75	35	4275-35-1016	322621	1057150	150
42	75	35	4275-35-1017	322677	1057201	
42	75	35	4275-35-1018	322690	1057249	189
42	75	35	4275-35-1019	322974	1057253	
42	75	35	4275-35-102	322724	1058253	
42	75	35	4275-35-1020	320360	1056597	237
42	75	35	4275-35-1021	320352	1056501	228.9
42	75	35	4275-35-1022	320394	1056451	235.7
42	75	35	4275-35-1023	320446	1056444	224.9
42	75	35	4275-35-1024	320577	1056449	232
42	75	35	4275-35-1025	320626	1056449	228
42	75	35	4275-35-1026	320223	1056751	217
42	75	35	4275-35-1027	320230	1056703	217.9
42	75	35	4275-35-1028	320179	1056703	232.9
42	75	35	4275-35-1029	320120	1056650	220.9
42	75	35	4275-35-103	323720	1059256	
42	75	35	4275-35-1030	320077	1056760	223

Table 3.3-1 Moore Ranch Drill Holes

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-1031	320270	1056799	237
42	75	35	4275-35-1032	321078	1056891	237
42	75	35	4275-35-1033	321108	1056898	231.8
42	75	35	4275-35-1034	321153	1056895	234
42	75	35	4275-35-1035	321228	1056897	234
42	75	35	4275-35-1036	321257	1056898	233
42	75	35	4275-35-1037	321286	1056894	225
42	75	35	4275-35-1038	321269	1056948	227.9
42	75	35	4275-35-1039	321261	1057002	236
42	75	35	4275-35-104	323323	1058656	292.6
42	75	35	4275-35-1040	320777	1057051	233
42	75	35	4275-35-1041	320881	1056902	234
42	75	35	4275-35-1042	320878	1056808	235
42	75	35	4275-35-1043	320826	1056704	235.9
42	75	35	4275-35-1044	322709	1057009	150
42	75	35	4275-35-1045	322760	1057009	192.9
42	75	35	4275-35-1046	322815	1057013	192.9
42	75	35	4275-35-1047	322857	1057061	195.9
42	75	35	4275-35-1048	323024	1057491	214
42	75	35	4275-35-1049	323079	1057572	234.9
42	75	35	4275-35-105	323122	1058454	
42	75	35	4275-35-1050	323079	1057618	230.9
42	75	35	4275-35-1051	323077	1057699	233.8
42	75	35	4275-35-1052	323120	1057802	273.9
42	75	35	4275-35-1053	323223	1057902	271.9
42	75	35	4275-35-1054	323226	1058104	269.5
42	75	35	4275-35-1055	323277	1058262	272
42	75	35	4275-35-1056	323375	1058406	149.9
42	75	35	4275-35-1057	323476	1058551	199.7
42	75	35	4275-35-1058	323371	1058757	150
42	75	35	4275-35-1059	323370	1058800	276.8
42	75	35	4275-35-106	323124	1058253	
42	75	35	4275-35-1060	323370	1058900	278
42	75	35	4275-35-1061	323375	1058955	276.9
42	75	35	4275-35-1062	323428	1058907	277.9
42	75	35	4275-35-1063	323172	1058905	271
42	75	35	4275-35-1064	322971	1058656	374
42	75	35	4275-35-1065	322829	1058197	273.9
42	75	35	4275-35-1066	322679	1058501	274.9
42	75	35	4275-35-1067	322475	1058255	274.8
42	75	35	4275-35-1068	322425	1058257	276.9
42	75	35	4275-35-1069	322428	1058211	251.6
42	75	35	4275-35-107	322824	1058153	274.8
42	75	35	4275-35-1070	322325	1058206	236.8

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-1071	322275	1058205	226.8
42	75	35	4275-35-1072	322224	1058206	235.7
42	75	35	4275-35-1073	321623	1058002	233.9
42	75	35	4275-35-1074	321525	1058004	216.9
42	75	35	4275-35-1075	321325	1058006	215.8
42	75	35	4275-35-1076	321422	1057703	214.9
42	75	35	4275-35-1077	321474	1057650	214
42	75	35	4275-35-1078	321526	1057005	206.9
42	75	35	4275-35-1079	321470	1057000	211.8
42	75	35	4275-35-108	322525	1058254	
42	75	35	4275-35-1080	321426	1057002	214.9
42	75	35	4275-35-1081	321419	1056953	211.9
42	75	35	4275-35-1082	321362	1056944	215
42	75	35	4275-35-1083	323377	1059005	292.9
42	75	35	4275-35-1084	323313	1059010	291.9
42	75	35	4275-35-1085	323272	1059006	292.9
42	75	35	4275-35-1086	323271	1058955	272.9
42	75	35	4275-35-1087	321476	1056701	217.8
42	75	35	4275-35-1088	321578	1057101	216
42	75	35	4275-35-1089	321884	1056702	214.9
42	75	35	4275-35-109	323322	1059056	
42	75	35	4275-35-1090	321971	1057000	214
42	75	35	4275-35-1091	322073	1057153	213.9
42	75	35	4275-35-1092	322653	1057010	191.9
42	75	35	4275-35-1093	322653	1056959	193.9
42	75	35	4275-35-1094	322710	1056953	191.9
42	75	35	4275-35-1095	322765	1056953	190.9
42	75	35	4275-35-1096	322870	1057021	215.9
42	75	35	4275-35-1097	322921	1057014	213
42	75	35	4275-35-1098	322912	1057068	215.8
42	75	35	4275-35-1099	321372	1056904	219
42	75	35	4275-35-11	321725	1058052	
42	75	35	4275-35-110	323524	1059059	
42	75	35	4275-35-1100	321374	1056847	214
42	75	35	4275-35-1101	321927	1056804	212.7
42	75	35	4275-35-1102	322384	1057354	215
42	75	35	4275-35-1103	322685	1057308	192
42	75	35	4275-35-1104	322638	1057308	193.9
42	75	35	4275-35-1105	322631	1057261	191
42	75	35	4275-35-1106	322623	1057208	191
42	75	35	4275-35-1107	323268	1058154	249.9
42	75	35	4275-35-1108	323273	1058101	250.9
42	75	35	4275-35-1109	323281	1058056	255.9
42	75	35	4275-35-111	322426	1058053	

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-1110	320678	1056500	235.9
42	75	35	4275-35-1111	320671	1056443	234.9
42	75	35	4275-35-1112	320675	1056396	232.9
42	75	35	4275-35-1113	320622	1056396	229.9
42	75	35	4275-35-1114	320571	1056397	231
42	75	35	4275-35-1115	320523	1056397	236.9
42	75	35	4275-35-1116	320347	1056453	232.9
42	75	35	4275-35-1117	320305	1056548	234
42	75	35	4275-35-1118	320314	1056605	234.9
42	75	35	4275-35-1119	320277	1056705	234.7
42	75	35	4275-35-112	322225	1057954	
42	75	35	4275-35-1120	320273	1056747	235.9
42	75	35	4275-35-1121	320375	1056746	228
42	75	35	4275-35-1122	320417	1056700	233
42	75	35	4275-35-1123	320473	1056800	231.9
42	75	35	4275-35-1124	320675	1056754	231.8
42	75	35	4275-35-1125	320724	1056803	231.8
42	75	35	4275-35-1126	320773	1056803	236
42	75	35	4275-35-1127	320779	1056853	233
42	75	35	4275-35-1128	320777	1056900	231.9
42	75	35	4275-35-1129	320834	1057103	247.4
42	75	35	4275-35-113	322324	1057953	
42	75	35	4275-35-1130	320782	1057104	249.5
42	75	35	4275-35-1131	320733	1057100	250.9
42	75	35	4275-35-1132	320170	1056850	253.9
42	75	35	4275-35-1133	322373	1057248	215.2
42	75	35	4275-35-1134	322367	1057198	194.9
42	75	35	4275-35-1135	322370	1057148	194.7
42	75	35	4275-35-1136	322417	1057148	194.7
42	75	35	4275-35-1137	322713	1056907	197
42	75	35	4275-35-1138	322662	1056913	194
42	75	35	4275-35-1139	322610	1056916	193
42	75	35	4275-35-114	322125	1057954	231.7
42	75	35	4275-35-1140	322609	1056961	192.9
42	75	35	4275-35-1141	322606	1057006	191.9
42	75	35	4275-35-1142	322570	1057149	190.6
42	75	35	4275-35-1143	322568	1057198	191.9
42	75	35	4275-35-1144	322570	1057256	192
42	75	35	4275-35-1145	322569	1057308	189.9
42	75	35	4275-35-1146	323318	1058153	254
42	75	35	4275-35-1147	323325	1058102	250.3
42	75	35	4275-35-1148	323332	1058052	258.9
42	75	35	4275-35-1149	320301	1056501	234.9
42	75	35	4275-35-115	322225	1057851	215

Table 3.3-1 Moore Ranch Drill Holes

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-1150	320300	1056451	233.9
42	75	35	4275-35-1151	320291	1056402	229.9
42	75	35	4275-35-1152	320344	1056408	230.9
42	75	35	4275-35-1153	320391	1056406	231.9
42	75	35	4275-35-1154	320569	1056352	214.9
42	75	35	4275-35-1155	320616	1056350	212
42	75	35	4275-35-1156	320670	1056351	213
42	75	35	4275-35-1157	320719	1056349	211
42	75	35	4275-35-1158	322466	1057151	194.7
42	75	35	4275-35-1159	320723	1056439	210.8
42	75	35	4275-35-116	322027	1057851	
42	75	35	4275-35-1160	320727	1056496	236
42	75	35	4275-35-1161	321324	1056904	213.9
42	75	35	4275-35-1162	321321	1056952	220
42	75	35	4275-35-1163	321318	1056999	213.7
42	75	35	4275-35-1164	321368	1057000	218.9
42	75	35	4275-35-1165	321369	1057048	215.9
42	75	35	4275-35-1166	321423	1057051	217.8
42	75	35	4275-35-1167	321474	1057052	218.8
42	75	35	4275-35-1168	321574	1057103	216.8
42	75	35	4275-35-1169	320620	1056600	231
42	75	35	4275-35-117	321925	1057950	
42	75	35	4275-35-1170	322520	1058300	236.9
42	75	35	4275-35-1171	323272	1059054	275.9
42	75	35	4275-35-1172	323371	1059055	293.9
42	75	35	4275-35-1173	323420	1059000	292.8
42	75	35	4275-35-1174	323421	1058803	292.9
42	75	35	4275-35-1175	322717	1056857	188.7
42	75	35	4275-35-1176	322667	1056862	214.6
42	75	35	4275-35-1177	322617	1056865	215.7
42	75	35	4275-35-1178	322560	1056960	192.8
42	75	35	4275-35-1179	321574	1056554	192.7
42	75	35	4275-35-118	321826	1057851	
42	75	35	4275-35-1180	322558	1057050	192.4
42	75	35	4275-35-1181	322565	1057099	193.5
42	75	35	4275-35-1182	322520	1057099	213.7
42	75	35	4275-35-1183	322518	1057305	214.9
42	75	35	4275-35-1184	322521	1057149	211.9
42	75	35	4275-35-1185	322514	1057188	209.9
42	75	35	4275-35-1186	323520	1059300	275.3
42	75	35	4275-35-1187	323468	1059305	273.9
42	75	35	4275-35-1188	323419	1059301	277.9
42	75	35	4275-35-1189	320678	1057050	237.8
42	75	35	4275-35-119	321928	1057751	232.4

Table 3.3-1 Moore Ranch Drill Holes

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-1190	322478	1057196	188.8
42	75	35	4275-35-1191	320684	1057150	236.8
42	75	35	4275-35-1192	320734	1057150	237
42	75	35	4275-35-1193	320783	1057155	236
42	75	35	4275-35-1194	320833	1057151	256.9
42	75	35	4275-35-1195	320880	1057154	234.8
42	75	35	4275-35-1196	320884	1057104	257.8
42	75	35	4275-35-1197	320883	1057052	255
42	75	35	4275-35-1198	321576	1057151	212.9
42	75	35	4275-35-1199	322461	1057350	198
42	75	35	4275-35-12	320925	1057651	
42	75	35	4275-35-120	321725	1057952	
42	75	35	4275-35-1200	322469	1057302	192
42	75	35	4275-35-1201	322477	1057246	196.9
42	75	35	4275-35-1202	322510	1057051	192.9
42	75	35	4275-35-1203	322511	1057007	194.9
42	75	35	4275-35-1204	322511	1056962	197.8
42	75	35	4275-35-1205	322514	1056915	194.08
42	75	35	4275-35-1206	322570	1056914	196.6
42	75	35	4275-35-1207	321827	1058206	255.8
42	75	35	4275-35-1208	321878	1058204	255.9
42	75	35	4275-35-1209	321924	1058206	257.9
42	75	35	4275-35-121	321725	1057752	233.9
42	75	35	4275-35-1210	323319	1059103	
42	75	35	4275-35-1211	323364	1059105	293.8
42	75	35	4275-35-1212	323417	1059107	296.8
42	75	35	4275-35-1213	321422	1057097	217.5
42	75	35	4275-35-1214	323519	1059210	275.7
42	75	35	4275-35-1215	321522	1057102	211.8
42	75	35	4275-35-1216	321518	1057153	211.9
42	75	35	4275-35-1217	322422	1057296	193.4
42	75	35	4275-35-1218	322426	1057246	196.2
42	75	35	4275-35-1219	322434	1057198	212.5
42	75	35	4275-35-122	322127	1057752	217.8
42	75	35	4275-35-1220	321467	1057149	213
42	75	35	4275-35-1221	322419	1057353	191.6
42	75	35	4275-35-1222	323372	1059155	274.6
42	75	35	4275-35-1223	323370	1059200	275.9
42	75	35	4275-35-1224	323424	1059207	268.8
42	75	35	4275-35-1225	323473	1059209	272.8
42	75	35	4275-35-1226	323472	1059160	276
42	75	35	4275-35-1227	323465	1059110	293.8
42	75	35	4275-35-1228	323475	1059061	275.7
42	75	35	4275-35-1229	323516	1059113	276.8

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-123	322327	1057758	
42	75	35	4275-35-1230	321473	1057100	212.9
42	75	35	4275-35-1231	323470	1059250	277
42	75	35	4275-35-1232	323371	1059257	270.9
42	75	35	4275-35-1233	321515	1057201	210
42	75	35	4275-35-1234	321572	1057203	214
42	75	35	4275-35-1235	321621	1057199	213.9
42	75	35	4275-35-1236	320120	1056350	234.9
42	75	35	4275-35-1237	320120	1056250	235
42	75	35	4275-35-1238	320120	1056150	234.9
42	75	35	4275-35-1239	320722	1056397	231.7
42	75	35	4275-35-124	321626	1057651	237.2
42	75	35	4275-35-1240	320476	1056899	233.9
42	75	35	4275-35-1241	320480	1056947	231.8
42	75	35	4275-35-1242	320531	1056942	237.7
42	75	35	4275-35-1243	320580	1056942	236.9
42	75	35	4275-35-1244	323566	1059255	295.9
42	75	35	4275-35-1245	323568	1059305	294.9
42	75	35	4275-35-1246	323568	1059358	290.5
42	75	35	4275-35-1247	323520	1059355	290.9
42	75	35	4275-35-1248	323470	1059358	274.8
42	75	35	4275-35-1249	320770	1056446	235.9
42	75	35	4275-35-125	321824	1057652	
42	75	35	4275-35-1250	320768	1056396	215
42	75	35	4275-35-1251	320772	1056350	215.9
42	75	35	4275-35-1252	320774	1056305	236
42	75	35	4275-35-1253	320725	1056298	214.8
42	75	35	4275-35-1254	320770	1056495	231.9
42	75	35	4275-35-1255	320675	1056292	
42	75	35	4275-35-1256	320683	1057099	233
42	75	35	4275-35-1257	320938	1057195	199.9
42	75	35	4275-35-1258C	322572	1059137	276.9
42	75	35	4275-35-1259C	322540	1056435	276.9
42	75	35	4275-35-126	321726	1057452	
42	75	35	4275-35-1260C	322581	1059557	194.9
42	75	35	4275-35-1261	322524	1058281	227.8
42	75	35	4275-35-1262	322570	1057347	196
42	75	35	4275-35-1263	322566	1057548	219.9
42	75	35	4275-35-1264	323470	1059000	222.8
42	75	35	4275-35-1265	323520	1059000	292.9
42	75	35	4275-35-1266	323570	1059000	295.9
42	75	35	4275-35-1267	323570	1059050	294
42	75	35	4275-35-1268	323570	1059100	294
42	75	35	4275-35-1269	323270	1058200	258.9

Table 3.3-1 Moore Ranch Drill Holes

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-127	322924	1058353	243.8
42	75	35	4275-35-1270	323270	1058000	258.9
42	75	35	4275-35-1271	323270	1057950	259.9
42	75	35	4275-35-1272	323270	1057900	249.9
42	75	35	4275-35-1273	322320	1057300	195.6
42	75	35	4275-35-1274	322270	1057250	195.8
42	75	35	4275-35-1275	322320	1057200	195.8
42	75	35	4275-35-1276	322470	1057050	199
42	75	35	4275-35-1277	322470	1057000	199
42	75	35	4275-35-1278	322470	1056950	199
42	75	35	4275-35-1279	321370	1056550	214
42	75	35	4275-35-128	323026	1058351	
42	75	35	4275-35-1280	321470	1056650	215.9
42	75	35	4275-35-1281	320370	1056700	234.8
42	75	35	4275-35-1282	320320	1056700	234
42	75	35	4275-35-1283	322970	1056900	215
42	75	35	4275-35-1284	323170	1056900	217
42	75	35	4275-35-1285	322170	1057100	218.9
42	75	35	4275-35-1286	322170	1057300	218.9
42	75	35	4275-35-1287	323570	1057700	277.9
42	75	35	4275-35-1288	323570	1058100	277.9
42	75	35	4275-35-1289	323370	1058150	259
42	75	35	4275-35-129	322922	1058151	274.7
42	75	35	4275-35-1290	323370	1058100	258.9
42	75	35	4275-35-1291	323370	1058050	258.9
42	75	35	4275-35-1292	323820	1058750	295.9
42	75	35	4275-35-1293	323820	1058950	294
42	75	35	4275-35-1294	323820	1059150	282.9
42	75	35	4275-35-1295	322568	1057294	239
42	75	35	4275-35-1296	320820	1056450	214.9
42	75	35	4275-35-1297	320820	1056400	218
42	75	35	4275-35-1298	320820	1056350	216.9
42	75	35	4275-35-1299	320820	1056300	218
42	75	35	4275-35-13	320184	1057233	
42	75	35	4275-35-130	322820	1058254	287.1
42	75	35	4275-35-1300	320820	1056250	216
42	75	35	4275-35-1301	320820	1057200	238
42	75	35	4275-35-1302	320770	1057200	237
42	75	35	4275-35-1303	320720	1057200	
42	75	35	4275-35-1304	320670	1057200	237.9
42	75	35	4275-35-1305	320620	1057200	238
42	75	35	4275-35-1306	320920	1057200	238
42	75	35	4275-35-1307	320970	1057200	237.8
42	75	35	4275-35-1308	320770	1056250	214.9

Table 3.3-1 Moore Ranch Drill Holes

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-1309	320720	1056250	214
42	75	35	4275-35-131	322723	1058151	274.7
42	75	35	4275-35-1310	320670	1056250	214
42	75	35	4275-35-1311	320620	1056250	216.9
42	75	35	4275-35-1312	320620	1056300	217
42	75	35	4275-35-1313	320620	1057150	237.9
42	75	35	4275-35-1314	320620	1057100	236.6
42	75	35	4275-35-1315	320622	1056999	236.8
42	75	35	4275-35-1316	320680	1056999	235.9
42	75	35	4275-35-1317	320970	1057150	239
42	75	35	4275-35-1318	320970	1057100	238.6
42	75	35	4275-35-1319	320970	1057050	238
42	75	35	4275-35-132	321624	1057755	
42	75	35	4275-35-1320	320927	1057103	238
42	75	35	4275-35-1321	320720	1056050	212.9
42	75	35	4275-35-1322	320720	1055850	215
42	75	35	4275-35-1323	320420	1056350	235
42	75	35	4275-35-1324	320370	1056350	234
42	75	35	4275-35-1325	320320	1056350	236
42	75	35	4275-35-1326	320270	1056350	238
42	75	35	4275-35-1327	320220	1056400	235.8
42	75	35	4275-35-1328	320220	1056450	236
42	75	35	4275-35-1329	321120	1056850	237.8
42	75	35	4275-35-133	321826	1057754	
42	75	35	4275-35-1330	321120	1056650	238.9
42	75	35	4275-35-1331	321120	1056450	235.9
42	75	35	4275-35-1332	321120	1056250	236.9
42	75	35	4275-35-1333	320620	1056200	217.9
42	75	35	4275-35-1334	320670	1056200	215.9
42	75	35	4275-35-1335	320720	1056200	215.9
42	75	35	4275-35-1336	321470	1056550	215.9
42	75	35	4275-35-1337	321470	1056600	216
42	75	35	4275-35-1338	321420	1056600	216
42	75	35	4275-35-1339	321420	1056700	216
42	75	35	4275-35-134	321726	1057551	
42	75	35	4275-35-1340	321324	1056449	235.9
42	75	35	4275-35-1341	321820	1056650	215.9
42	75	35	4275-35-1342	321770	1056650	246
42	75	35	4275-35-1343	321870	1056650	215
42	75	35	4275-35-1344	322570	1056700	216
42	75	35	4275-35-1345	322570	1056500	215.8
42	75	35	4275-35-1346	320770	1056200	214
42	75	35	4275-35-1347	320720	1056150	216
42	75	35	4275-35-1348	320670	1056150	215.9

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-1349	320620	1056150	215.9
42	75	35	4275-35-135	321924	1057653	
42	75	35	4275-35-1350	320570	1056150	215.9
42	75	35	4275-35-1351	320570	1056250	216
42	75	35	4275-35-1352	320570	1056200	215
42	75	35	4275-35-1353	321525	1056500	216
42	75	35	4275-35-1354	321602	1056475	214
42	75	35	4275-35-1355	321623	1056498	214
42	75	35	4275-35-1356	323320	1058200	255.9
42	75	35	4275-35-1357	323320	1058250	253.9
42	75	35	4275-35-1358	320720	1056100	218.8
42	75	35	4275-35-1359	320670	1056100	218.9
42	75	35	4275-35-136	322027	1057954	
42	75	35	4275-35-1360	320620	1056100	149.9
42	75	35	4275-35-1361	320770	1056100	218
42	75	35	4275-35-1362	320770	1056150	218
42	75	35	4275-35-1363	322570	1056650	215
42	75	35	4275-35-1364	322570	1056750	213.9
42	75	35	4275-35-1365	322620	1056700	215.9
42	75	35	4275-35-1366	322520	1056700	215
42	75	35	4275-35-1367	320270	1056650	237.8
42	75	35	4275-35-1368	322370	1056700	218.9
42	75	35	4275-35-1369	322570	1056900	234
42	75	35	4275-35-137	322423	1057951	
42	75	35	4275-35-1370	320320	1056300	247.6
42	75	35	4275-35-1371	320370	1056300	237.9
42	75	35	4275-35-1372	320420	1056300	238.9
42	75	35	4275-35-1373	320820	1056150	216
42	75	35	4275-35-1374	320820	1056200	214.8
42	75	35	4275-35-1375	321523	1056451	214.9
42	75	35	4275-35-1376	321520	1056450	215.9
42	75	35	4275-35-1377	321926	1056447	216
42	75	35	4275-35-1378	321470	1057450	218
42	75	35	4275-35-1379	321520	1057400	213.9
42	75	35	4275-35-138	322626	1058254	
42	75	35	4275-35-1380	321520	1057500	217.9
42	75	35	4275-35-1381	321470	1057500	218.8
42	75	35	4275-35-1382	321470	1057400	216.8
42	75	35	4275-35-1383	321570	1057400	216.9
42	75	35	4275-35-1384	321320	1057450	218.9
42	75	35	4275-35-1385	323820	1059350	295.9
42	75	35	4275-35-1386	323820	1059750	295.9
42	75	35	4275-35-1387	323620	1059450	294
42	75	35	4275-35-1388	323620	1059550	295

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-1389	323620	1059750	295.7
42	75	35	4275-35-139	322624	1058154	
42	75	35	4275-35-1390	322620	1056750	233.8
42	75	35	4275-35-1391	322670	1056750	217
42	75	35	4275-35-1392	322520	1056750	216.9
42	75	35	4275-35-1393	322520	1056650	215.9
42	75	35	4275-35-1394	322620	1056650	215.9
42	75	35	4275-35-1395	322670	1056650	215
42	75	35	4275-35-1396	322670	1056700	211.9
42	75	35	4275-35-1397	321579	1057503	215
42	75	35	4275-35-1398	321420	1057150	217.9
42	75	35	4275-35-1399	321120	1056950	233.8
42	75	35	4275-35-14	321725	1058852	
42	75	35	4275-35-140	321625	1057851	
42	75	35	4275-35-1400	321120	1057150	238.9
42	75	35	4275-35-1401	321120	1057350	219
42	75	35	4275-35-1402	321120	1057550	218.9
42	75	35	4275-35-1403	320920	1055850	215.8
42	75	35	4275-35-1404	321120	1055850	234.9
42	75	35	4275-35-1405	320520	1055850	217.9
42	75	35	4275-35-1406	320320	1055850	218.8
42	75	35	4275-35-1407	320120	1055850	215.9
42	75	35	4275-35-1408	320320	1056050	217.9
42	75	35	4275-35-1409	322170	1056700	216
42	75	35	4275-35-141	322525	1058153	
42	75	35	4275-35-1410	322170	1056900	215
42	75	35	4275-35-1411	322170	1057050	216
42	75	35	4275-35-1412	321120	1056050	214
42	75	35	4275-35-1413	321521	1056046	215.9
42	75	35	4275-35-1414	321924	1056054	216.9
42	75	35	4275-35-1415	320270	1057100	237.9
42	75	35	4275-35-1416	320270	1057050	237.9
42	75	35	4275-35-1417	320273	1056995	236.5
42	75	35	4275-35-1418	320370	1057100	236
42	75	35	4275-35-1419	320370	1057050	236
42	75	35	4275-35-142	323125	1058355	
42	75	35	4275-35-1420	320375	1056996	235.9
42	75	35	4275-35-1421	320320	1057100	236.9
42	75	35	4275-35-1422	320323	1056997	237
42	75	35	4275-35-1423	320570	1057200	238.9
42	75	35	4275-35-1424	320570	1057150	239
42	75	35	4275-35-1425	320570	1057250	235.9
42	75	35	4275-35-1426	320620	1057250	238.8
42	75	35	4275-35-1427	320670	1057250	238.9

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-1428	320420	1056250	236.8
42	75	35	4275-35-1429	320470	1056250	236.9
42	75	35	4275-35-143	323026	1058453	
42	75	35	4275-35-1430	320370	1056250	236.3
42	75	35	4275-35-1431	320470	1056350	236.9
42	75	35	4275-35-1432	320470	1056300	237.8
42	75	35	4275-35-1433	320920	1055650	218
42	75	35	4275-35-1434	322570	1056600	216.9
42	75	35	4275-35-1435	322520	1056600	216.9
42	75	35	4275-35-1436	322470	1056600	214.9
42	75	35	4275-35-1437	322470	1056700	216
42	75	35	4275-35-1438	322470	1056650	215
42	75	35	4275-35-1439	322670	1056800	213.8
42	75	35	4275-35-144	323024	1058253	
42	75	35	4275-35-1440	322619	1056808	212.9
42	75	35	4275-35-1441	322569	1056810	213.8
42	75	35	4275-35-1442	321723	1056857	216
42	75	35	4275-35-1443	322370	1056900	216.9
42	75	35	4275-35-1444	322820	1056900	212
42	75	35	4275-35-1445	320920	1056250	235.9
42	75	35	4275-35-1446	320920	1056600	232.6
42	75	35	4275-35-1447	320720	1056600	236.9
42	75	35	4275-35-1448	320220	1056950	233.4
42	75	35	4275-35-1449	320220	1057000	236.9
42	75	35	4275-35-145	322824	1058353	
42	75	35	4275-35-1450	320220	1057050	238
42	75	35	4275-35-1451	320320	1056200	236.9
42	75	35	4275-35-1452	320370	1056200	218.9
42	75	35	4275-35-1453	320420	1056200	237
42	75	35	4275-35-1454	320470	1056200	236.8
42	75	35	4275-35-1455	320320	1056250	238.9
42	75	35	4275-35-1456	320520	1057000	235.9
42	75	35	4275-35-1457	320570	1057000	237
42	75	35	4275-35-1458	321570	1057350	217
42	75	35	4275-35-1459	321470	1057350	217
42	75	35	4275-35-146	322724	1058102	
42	75	35	4275-35-1460	322170	1057200	215
42	75	35	4275-35-1461	322170	1056500	215
42	75	35	4275-35-1462	321520	1056350	215.6
42	75	35	4275-35-1463	321320	1056350	214.9
42	75	35	4275-35-1464	320270	1056950	236.7
42	75	35	4275-35-1465	320470	1057000	236
42	75	35	4275-35-1466	320520	1057200	237
42	75	35	4275-35-1467	322420	1056700	213.7

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-1468	322420	1056650	216
42	75	35	4275-35-1469	322420	1056600	216
42	75	35	4275-35-147	322823	1058102	
42	75	35	4275-35-1470	322420	1056550	214.9
42	75	35	4275-35-1471	322470	1056550	213.7
42	75	35	4275-35-1472	322520	1056550	215.8
42	75	35	4275-35-1473	322022	1056150	216.8
42	75	35	4275-35-1474	321920	1056150	215.7
42	75	35	4275-35-1475	321823	1056150	216.2
42	75	35	4275-35-1476	321620	1056150	215.7
42	75	35	4275-35-1477	321520	1056150	215.4
42	75	35	4275-35-1478	321420	1056150	216
42	75	35	4275-35-1479	321420	1056050	216
42	75	35	4275-35-148	322924	1058101	
42	75	35	4275-35-1480	321420	1055950	216
42	75	35	4275-35-1481	321520	1055950	210
42	75	35	4275-35-1482	321620	1055950	215
42	75	35	4275-35-1483	321820	1055950	216.9664
42	75	35	4275-35-1484	321920	1055950	213.8
42	75	35	4275-35-1485	322023	1055950	218.9
42	75	35	4275-35-1486	322020	1056045	217
42	75	35	4275-35-1487	321820	1056050	215.9
42	75	35	4275-35-1488	321724	1056051	215
42	75	35	4275-35-1489	321620	1056050	214.9
42	75	35	4275-35-149	322724	1058203	
42	75	35	4275-35-1490	320620	1057300	236.9
42	75	35	4275-35-1491	320570	1057300	236.8
42	75	35	4275-35-1492	320520	1057300	236.8
42	75	35	4275-35-1493	321320	1056250	234.9
42	75	35	4275-35-1494	320320	1056150	216
42	75	35	4275-35-1495	320370	1056150	215.9
42	75	35	4275-35-1496	320420	1056150	215
42	75	35	4275-35-1497	320720	1056550	235.9
42	75	35	4275-35-1498	320770	1056550	234.9
42	75	35	4275-35-1499	320770	1056600	235
42	75	35	4275-35-15	322124	1058054	
42	75	35	4275-35-150	322923	1058301	
42	75	35	4275-35-1500	320770	1056650	236.9
42	75	35	4275-35-1501	321420	1055900	216.9
42	75	35	4275-35-1502	321620	1055900	215
42	75	35	4275-35-1503	321520	1055900	217
42	75	35	4275-35-1504	322025	1056199	216.9
42	75	35	4275-35-1505	321820	1056250	196
42	75	35	4275-35-1506	321920	1056200	216.9

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-1507	322170	1057150	211.9
42	75	35	4275-35-1508	322170	1057250	212.9
42	75	35	4275-35-1509	322120	1057200	216
42	75	35	4275-35-151	322924	1058201	
42	75	35	4275-35-1510	322220	1057200	214
42	75	35	4275-35-1511	322220	1057250	214
42	75	35	4275-35-1512	322120	1057143	215
42	75	35	4275-35-1513	322220	1057150	217
42	75	35	4275-35-1514	320820	1056550	235
42	75	35	4275-35-1515	320820	1056600	235
42	75	35	4275-35-1516	320470	1056450	236.8
42	75	35	4275-35-1517	320120	1056050	215.9
42	75	35	4275-35-1518	320470	1056150	216.9
42	75	35	4275-35-1519	322720	1056750	213.9
42	75	35	4275-35-152	322823	1058202	
42	75	35	4275-35-1520	320620	1057350	236.9
42	75	35	4275-35-1521	320570	1057350	237.9
42	75	35	4275-35-1522	320670	1057350	236.9
42	75	35	4275-35-1523	320670	1057300	237
42	75	35	4275-35-1524	322174	1057099	198
42	75	35	4275-35-1525	322124	1057093	197
42	75	35	4275-35-1526	320520	1057300	197.9
42	75	35	4275-35-1527	322223	1057106	196.9
42	75	35	4275-35-1528	322170	1057300	214.9
42	75	35	4275-35-1529	322220	1057300	216
42	75	35	4275-35-153	323225	1058505	
42	75	35	4275-35-1530	322120	1057300	215
42	75	35	4275-35-1531	322270	1057200	196
42	75	35	4275-35-1532	322270	1057150	195
42	75	35	4275-35-1533	322516	1056858	217.7
42	75	35	4275-35-1534	322524	1056809	219.9
42	75	35	4275-35-1535	320720	1057350	238.9
42	75	35	4275-35-1536	320720	1057300	238.9
42	75	35	4275-35-1537	320720	1057250	236.9
42	75	35	4275-35-1538	323920	1060450	
42	75	35	4275-35-1539	324170	1059150	
42	75	35	4275-35-154	323321	1058507	
42	75	35	4275-35-1540	324170	1058750	
42	75	35	4275-35-1541	324170	1058350	
42	75	35	4275-35-1542	324170	1057950	
42	75	35	4275-35-1543	324170	1057550	
42	75	35	4275-35-1544	324570	1057950	
42	75	35	4275-35-1545	324570	1058350	
42	75	35	4275-35-1546	324570	1058750	

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-1547	324570	1059151	
42	75	35	4275-35-1548	324970	1059150	
42	75	35	4275-35-1549	324970	1058750	
42	75	35	4275-35-155	323322	1058606	
42	75	35	4275-35-1550	322895	1056900	
42	75	35	4275-35-1551	322820	1056800	
42	75	35	4275-35-1552	322820	1056700	
42	75	35	4275-35-1553	322170	1056304	
42	75	35	4275-35-1554	321420	1056250	
42	75	35	4275-35-1555	321420	1056350	
42	75	35	4275-35-1556	321420	1056450	
42	75	35	4275-35-1557	321105	1056747	
42	75	35	4275-35-1558	321020	1056750	
42	75	35	4275-35-1559	320920	1056750	
42	75	35	4275-35-156	322327	1057803	
42	75	35	4275-35-1560	321020	1056850	
42	75	35	4275-35-1561	321220	1056850	
42	75	35	4275-35-1562	321220	1056950	
42	75	35	4275-35-1563	321220	1057050	
42	75	35	4275-35-1564	321220	1057150	
42	75	35	4275-35-1565	321220	1057250	
42	75	35	4275-35-1566	321220	1057350	
42	75	35	4275-35-1567	321220	1057450	
42	75	35	4275-35-1568	321220	1057550	
42	75	35	4275-35-1569	321329	1057550	
42	75	35	4275-35-157	322275	1057853	
42	75	35	4275-35-1570	320820	1057550	
42	75	35	4275-35-1571	320820	1057650	
42	75	35	4275-35-1572	321023	1057366	
42	75	35	4275-35-1573	320620	1057650	
42	75	35	4275-35-1574	320520	1057750	
42	75	35	4275-35-1575	320920	1057750	
42	75	35	4275-35-1576	321020	1057750	
42	75	35	4275-35-1577	320420	1057550	
42	75	35	4275-35-1578	320420	1057350	
42	75	35	4275-35-1579	320420	1056050	
42	75	35	4275-35-158	322176	1057852	
42	75	35	4275-35-1580	320520	1055950	
42	75	35	4275-35-1581	320620	1055850	
42	75	35	4275-35-1582	320420	1055850	
42	75	35	4275-35-1583	320720	1055650	
42	75	35	4275-35-1584	320770	1057350	
42	75	35	4275-35-1585	320770	1057300	
42	75	35	4275-35-1586	320770	1057250	

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-1587	321720	1056150	
42	75	35	4275-35-1588	321870	1056150	
42	75	35	4275-35-1589	321920	1056300	
42	75	35	4275-35-159	322027	1057751	
42	75	35	4275-35-1590	321720	1055950	
42	75	35	4275-35-1591	321575	1056041	
42	75	35	4275-35-1592	321320	1057500	
42	75	35	4275-35-1593	323433	1059153	
42	75	35	4275-35-1594	321370	1056450	
42	75	35	4275-35-1595	321326	1056344	
42	75	35	4275-35-1596	321320	1056150	
42	75	35	4275-35-1597	321320	1055950	
42	75	35	4275-35-1598	321501	1055800	
42	75	35	4275-35-1599	321020	1056650	
42	75	35	4275-35-16	322124	1058454	
42	75	35	4275-35-160	322075	1057852	
42	75	35	4275-35-1600	321276	1056991	
42	75	35	4275-35-1601	321421	1057216	
42	75	35	4275-35-1602	320520	1057100	
42	75	35	4275-35-1603	320420	1057150	
42	75	35	4275-35-1604	324570	1058150	
42	75	35	4275-35-1605	324770	1058750	
42	75	35	4275-35-1606	324770	1058950	
42	75	35	4275-35-1607	324970	1058950	
42	75	35	4275-35-1608	320370	1056100	
42	75	35	4275-35-1609	320420	1055950	
42	75	35	4275-35-161	322524	1058051	
42	75	35	4275-35-1610	320620	1055650	
42	75	35	4275-35-1611	321620	1056100	
42	75	35	4275-35-1612	321720	1056100	
42	75	35	4275-35-1613	321820	1056100	
42	75	35	4275-35-1614	321820	1056200	
42	75	35	4275-35-1615	321620	1056000	
42	75	35	4275-35-1616	321970	1056100	
42	75	35	4275-35-1617	321926	1056242	
42	75	35	4275-35-1618	322035	1056297	
42	75	35	4275-35-1619	322570	1055700	
42	75	35	4275-35-162	322524	1057951	
42	75	35	4275-35-1620	322540	1056099	
42	75	35	4275-35-1621	322170	1055700	
42	75	35	4275-35-1622	321770	1055700	
42	75	35	4275-35-1623	321320	1055697	
42	75	35	4275-35-1624	321920	1056350	
42	75	35	4275-35-1625	322175	1056793	

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-1626	322275	1056700	
42	75	35	4275-35-1627	321570	1056000	
42	75	35	4275-35-1628	321570	1056100	
42	75	35	4275-35-1629	321220	1056750	
42	75	35	4275-35-163	322873	1058200	
42	75	35	4275-35-1630	321370	1057500	
42	75	35	4275-35-1631	321370	1057550	
42	75	35	4275-35-1632	322915	1056801	
42	75	35	4275-35-1633	321220	1057650	
42	75	35	4275-35-1634	324020	1056051	
42	75	35	4275-35-1635	321370	1056150	
42	75	35	4275-35-1636	321730	1056195	
42	75	35	4275-35-1637	321920	1056100	
42	75	35	4275-35-1638	321676	1056049	
42	75	35	4275-35-1639	321504	1055848	
42	75	35	4275-35-164	323420	1058955	
42	75	35	4275-35-1640	324670	1059053	
42	75	35	4275-35-1641	321370	1056350	
42	75	35	4275-35-1642	321370	1056250	
42	75	35	4275-35-1643	321120	1056800	
42	75	35	4275-35-1644	321000	1056698	
42	75	35	4275-35-1645	320820	1056050	
42	75	35	4275-35-1646	320920	1056350	
42	75	35	4275-35-1647	320920	1055950	
42	75	35	4275-35-1648	321120	1055950	
42	75	35	4275-35-1649	320920	1055750	
42	75	35	4275-35-165	323221	1058756	
42	75	35	4275-35-1650	321126	1055649	
42	75	35	4275-35-1651	321383	1056203	
42	75	35	4275-35-1652	321379	1056298	
42	75	35	4275-35-1653	321379	1056392	
42	75	35	4275-35-1654C	320576	1056600	
42	75	35	4275-35-1655C	320572	1056704	
42	75	35	4275-35-1656C	320570	1056799	
42	75	35	4275-35-1657	320933	1056301	
42	75	35	4275-35-1658	320933	1055997	
42	75	35	4275-35-1659	320870	1056049	
42	75	35	4275-35-166	323421	1058757	
42	75	35	4275-35-1660	320940	1055691	
42	75	35	4275-35-1661	321425	1056199	
42	75	35	4275-35-1662	321425	1056295	
42	75	35	4275-35-1663	321422	1056392	
42	75	35	4275-35-1664	322332	1055698	
42	75	35	4275-35-1665C	320771	1056324	

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-1666C	320646	1056419	
42	75	35	4275-35-1667C	320172	1056780	
42	75	35	4275-35-1668C	320710	1057078	
42	75	35	4275-35-1669C	320777	1056974	
42	75	35	4275-35-167	323420	1058657	
42	75	35	4275-35-1670C	320273	1056826	
42	75	35	4275-35-1671C	321502	1056774	
42	75	35	4275-35-1672C	321577	1056803	
42	75	35	4275-35-1673C	322790	1057107	
42	75	35	4275-35-1674	322242	1055695	
42	75	35	4275-35-1675C	322683	1057228	
42	75	35	4275-35-1676C	323397	1059208	
42	75	35	4275-35-1677	322328	1058345	
42	75	35	4275-35-1678C	322496	1056642	
42	75	35	4275-35-1679C	322121	1057170	
42	75	35	4275-35-168	323419	1058556	
42	75	35	4275-35-1680	321512	1055696	
42	75	35	4275-35-1681	321909	1055700	
42	75	35	4275-35-1682	321712	1055503	
42	75	35	4275-35-1683	322025	1056240	
42	75	35	4275-35-1684	322171	1056400	
42	75	35	4275-35-1685	322225	1056700	
42	75	35	4275-35-1686	320775	1056046	
42	75	35	4275-35-1687	321378	1056106	
42	75	35	4275-35-1688	321427	1056098	
42	75	35	4275-35-1689	321913	1055497	
42	75	35	4275-35-169	323420	1058458	
42	75	35	4275-35-1690	322325	1055500	
42	75	35	4275-35-1691	321717	1055603	
42	75	35	4275-35-1692	321539	1055504	
42	75	35	4275-35-1693	321335	1055504	
42	75	35	4275-35-1694	321636	1055801	
42	75	35	4275-35-1695	321813	1055797	
42	75	35	4275-35-1696	322168	1056352	
42	75	35	4275-35-1697	321473	1056452	
42	75	35	4275-35-1698	321474	1056499	
42	75	35	4275-35-1699	321426	1056495	
42	75	35	4275-35-17	322123	1058845	
42	75	35	4275-35-170	323324	1058357	
42	75	35	4275-35-1700	321382	1056497	
42	75	35	4275-35-1701	321473	1056044	
42	75	35	4275-35-1702	321475	1056093	
42	75	35	4275-35-1703C	323375	1058877	
42	75	35	4275-35-1704	321026	1057099	

Table [illegible] Drill Holes

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-1705	320929	1056510	
42	75	35	4275-35-1706	321323	1056391	
42	75	35	4275-35-1707	321315	1056489	
42	75	35	4275-35-1708	321323	1056549	218.9
42	75	35	4275-35-1709	321380	1056549	213
42	75	35	4275-35-171	323226	1058355	
42	75	35	4275-35-1710	321274	1057547	215.9
42	75	35	4275-35-1711	321221	1057851	217.8
42	75	35	4275-35-1712	324521	1055475	215.9
42	75	35	4275-35-1713	323164	1056686	
42	75	35	4275-35-1714	322931	1056701	
42	75	35	4275-35-1715	322770	1056644	
42	75	35	4275-35-1716	322271	1056795	
42	75	35	4275-35-1717	322282	1056506	
42	75	35	4275-35-1718	321123	1056549	
42	75	35	4275-35-1719	320727	1057499	
42	75	35	4275-35-172	323022	1058150	
42	75	35	4275-35-1720	320824	1057443	
42	75	35	4275-35-1721	320928	1057592	
42	75	35	4275-35-1722	321124	1057949	
42	75	35	4275-35-1723	323712	1059455	
42	75	35	4275-35-1724	324008	1059757	
42	75	35	4275-35-1725	324111	1060090	
42	75	35	4275-35-1726	321273	1057596	
42	75	35	4275-35-1727	321222	1057694	
42	75	35	4275-35-1728	321378	1056593	
42	75	35	4275-35-1729	321329	1056583	
42	75	35	4275-35-173	322922	1058052	
42	75	35	4275-35-1730	322224	1056501	
42	75	35	4275-35-1731	322079	1056590	
42	75	35	4275-35-1732	321275	1056601	
42	75	35	4275-35-1733	321275	1056653	
42	75	35	4275-35-1734	321817	1056697	
42	75	35	4275-35-1735	321978	1056600	
42	75	35	4275-35-1736	321159	1057386	
42	75	35	4275-35-1737	321142	1055498	
42	75	35	4275-35-1738	320307	1055644	
42	75	35	4275-35-1739	321425	1056547	
42	75	35	4275-35-174	322825	1058052	
42	75	35	4275-35-1740	322404	1056800	
42	75	35	4275-35-1741	321720	1055452	
42	75	35	4275-35-1742	321690	1055756	
42	75	35	4275-35-1743	321789	1055743	
42	75	35	4275-35-1744	322272	1056035	

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-1745	321222	1056797	
42	75	35	4275-35-1746	321325	1056748	
42	75	35	4275-35-1747	321066	1056746	
42	75	35	4275-35-1748	320918	1056695	
42	75	35	4275-35-1749	322030	1056595	
42	75	35	4275-35-175	322423	1058152	
42	75	35	4275-35-1750	321983	1056551	
42	75	35	4275-35-1751	321723	1056502	
42	75	35	4275-35-1752	322458	1056803	
42	75	35	4275-35-1753	320345	1056107	
42	75	35	4275-35-1754	320127	1055951	
42	75	35	4275-35-1755	320126	1056558	
42	75	35	4275-35-1756	320229	1056359	
42	75	35	4275-35-1757	321070	1056701	
42	75	35	4275-35-1758	322036	1056540	
42	75	35	4275-35-1759	321932	1056559	
42	75	35	4275-35-176	322424	1057852	
42	75	35	4275-35-1760	321934	1056604	
42	75	35	4275-35-1761	322404	1056848	
42	75	35	4275-35-1762	322405	1056750	
42	75	35	4275-35-1763	322070	1056403	
42	75	35	4275-35-1764	322080	1056490	
42	75	35	4275-35-1765	321370	1056650	
42	75	35	4275-35-1766	320372	1056947	
42	75	35	4275-35-1767	320122	1057002	
42	75	35	4275-35-1768	320121	1057051	
42	75	35	4275-35-1769	320320	1057200	
42	75	35	4275-35-177	322219	1057750	
42	75	35	4275-35-1770	320478	1057137	
42	75	35	4275-35-1771	320869	1057199	
42	75	35	4275-35-1772	320869	1057342	
42	75	35	4275-35-1773	321027	1057409	
42	75	35	4275-35-1774	322083	1056543	
42	75	35	4275-35-1775	321974	1056652	
42	75	35	4275-35-1776	322080	1056550	
42	75	35	4275-35-1777	322021	1056659	
42	75	35	4275-35-1778	321925	1056653	
42	75	35	4275-35-1779	321988	1056491	
42	75	35	4275-35-178	322226	1058054	
42	75	35	4275-35-1780	322040	1056500	
42	75	35	4275-35-1781	322136	1056538	
42	75	35	4275-35-1782	321930	1056705	
42	75	35	4275-35-1783	322116	1056488	
42	75	35	4275-35-1784	321927	1056763	

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-1785	321982	1056703	
42	75	35	4275-35-1786	322119	1056431	
42	75	35	4275-35-1787	321981	1056758	
42	75	35	4275-35-1788	322135	1056589	
42	75	35	4275-35-1789	321891	1056610	
42	75	35	4275-35-179	321811	1057553	
42	75	35	4275-35-1790	321942	1056512	
42	75	35	4275-35-1791	320167	1056999	
42	75	35	4275-35-1792	320072	1057001	
42	75	35	4275-35-1793	320170	1057190	
42	75	35	4275-35-1794	320272	1057193	
42	75	35	4275-35-1795	320220	1057150	
42	75	35	4275-35-1796	320070	1057050	
42	75	35	4275-35-1797	320170	1057050	
42	75	35	4275-35-1798	320170	1056950	
42	75	35	4275-35-1799	320070	1056950	
42	75	35	4275-35-18	322525	1058458	
42	75	35	4275-35-180	321627	1057551	
42	75	35	4275-35-1800	322070	1056650	
42	75	35	4275-35-1801	321970	1056450	
42	75	35	4275-35-1802	321820	1056550	
42	75	35	4275-35-1803	320930	1057650	
42	75	35	4275-35-1804	320070	1057050	
42	75	35	4275-35-181	321526	1057652	
42	75	35	4275-35-1811C	322236.5	1057812	
42	75	35	4275-35-1812C	323077.6	1058306	279
42	75	35	4275-35-1813C	320650	1057250	229
42	75	35	4275-35-1813C	320650	1057250	229
42	75	35	4275-35-1814C	320575	1056555	206
42	75	35	4275-35-1814C	320575	1056555	206
42	75	35	4275-35-1816	320600	1056530	
42	75	35	4275-35-1817	320575	1056750	
42	75	35	4275-35-182	320330	1057346	
42	75	35	4275-35-183	320425	1057450	
42	75	35	4275-35-184	320725	1057551	
42	75	35	4275-35-185	320926	1057551	
42	75	35	4275-35-186	321023	1057651	
42	75	35	4275-35-187	321030	1057855	
42	75	35	4275-35-188	321325	1057752	
42	75	35	4275-35-189	322623	1058052	
42	75	35	4275-35-19	322524	1057653	
42	75	35	4275-35-190C	322899	1058176	289.4
42	75	35	4275-35-191C	322897	1058126	274.9
42	75	35	4275-35-192C	322901	1058227	263.6

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-193C	322902	1058277	288.9
42	75	35	4275-35-194C	322905	1058326	313.6
42	75	35	4275-35-195C	322904	1058377	316
42	75	35	4275-35-196C	322896	1058076	274.9
42	75	35	4275-35-197C	322894	1058026	273.8
42	75	35	4275-35-198	320729	1056850	
42	75	35	4275-35-199	320929	1056954	
42	75	35	4275-35-2	325296	1057941	
42	75	35	4275-35-20	322125	1057653	
42	75	35	4275-35-200	320828	1057051	
42	75	35	4275-35-201	320625	1057751	
42	75	35	4275-35-202	320726	1057751	
42	75	35	4275-35-203	320825	1057750	
42	75	35	4275-35-204	320724	1057952	
42	75	35	4275-35-205	321224	1057751	
42	75	35	4275-35-206	321423	1057751	
42	75	35	4275-35-207	321327	1057051	
42	75	35	4275-35-208	321526	1057249	
42	75	35	4275-35-209	321725	1057354	
42	75	35	4275-35-21	320927	1057270	
42	75	35	4275-35-210	321526	1057450	
42	75	35	4275-35-211	321821	1057455	
42	75	35	4275-35-212	321922	1057551	
42	75	35	4275-35-213	322022	1057553	
42	75	35	4275-35-214	322026	1057655	
42	75	35	4275-35-215	322225	1057651	
42	75	35	4275-35-216	322329	1057651	
42	75	35	4275-35-217	322425	1057755	
42	75	35	4275-35-218	322526	1057851	
42	75	35	4275-35-219	322625	1057951	
42	75	35	4275-35-22	320527	1057249	
42	75	35	4275-35-220	321826	1057945	
42	75	35	4275-35-221	322023	1058054	
42	75	35	4275-35-222	322225	1058154	
42	75	35	4275-35-223	322324	1058155	
42	75	35	4275-35-224	322724	1057950	
42	75	35	4275-35-225	322824	1057950	
42	75	35	4275-35-226	322924	1057949	
42	75	35	4275-35-227	323019	1058054	
42	75	35	4275-35-228	322724	1058354	
42	75	35	4275-35-229	322726	1058454	
42	75	35	4275-35-23	320526	1057652	
42	75	35	4275-35-230	322922	1058657	
42	75	35	4275-35-231	323027	1058556	

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-232	323023	1058656	
42	75	35	4275-35-233	323124	1058755	
42	75	35	4275-35-234	323224	1058856	
42	75	35	4275-35-235	323323	1058956	
42	75	35	4275-35-236	323422	1059058	
42	75	35	4275-35-237	323516	1059158	
42	75	35	4275-35-238	323620	1059255	
42	75	35	4275-35-239	323622	1059158	
42	75	35	4275-35-24	320527	1060449	
42	75	35	4275-35-240	323622	1059059	
42	75	35	4275-35-241	323621	1058958	
42	75	35	4275-35-242	323620	1058660	
42	75	35	4275-35-243	323522	1059455	
42	75	35	4275-35-244	323521	1059653	
42	75	35	4275-35-245	323721	1059855	
42	75	35	4275-35-246	323920	1060253	
42	75	35	4275-35-247	321627	1057451	
42	75	35	4275-35-248	323223	1058955	
42	75	35	4275-35-249	323123	1058855	
42	75	35	4275-35-25	320930	1059049	
42	75	35	4275-35-250	322927	1058554	
42	75	35	4275-35-251	322824	1058453	
42	75	35	4275-35-252	322725	1058553	
42	75	35	4275-35-253	322627	1058454	
42	75	35	4275-35-254	322625	1058354	
42	75	35	4275-35-255	323119	1058058	
42	75	35	4275-35-256	323024	1057950	
42	75	35	4275-35-257	322920	1057852	
42	75	35	4275-35-258	322825	1057850	
42	75	35	4275-35-259	322724	1057850	
42	75	35	4275-35-26	320929	1059849	
42	75	35	4275-35-260	322623	1057850	
42	75	35	4275-35-261	322527	1057750	
42	75	35	4275-35-262	322432	1057652	
42	75	35	4275-35-263	322330	1057551	
42	75	35	4275-35-264	322232	1057551	
42	75	35	4275-35-265	321922	1057451	
42	75	35	4275-35-266	321825	1057356	
42	75	35	4275-35-267	321726	1057253	
42	75	35	4275-35-268	321625	1057350	
42	75	35	4275-35-269	321426	1057447	
42	75	35	4275-35-27	320910	1060451	
42	75	35	4275-35-270	321526	1057548	
42	75	35	4275-35-271	321524	1057753	

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-272	321623	1057953	
42	75	35	4275-35-273	321827	1058047	
42	75	35	4275-35-274	321925	1058052	
42	75	35	4275-35-275	322025	1058153	
42	75	35	4275-35-276	320324	1056852	
42	75	35	4275-35-277	320527	1056454	
42	75	35	4275-35-278	323422	1059157	
42	75	35	4275-35-279	322124	1058152	
42	75	35	4275-35-28	320528	1060049	
42	75	35	4275-35-280	321520	1057952	
42	75	35	4275-35-281	321526	1057349	
42	75	35	4275-35-282	322724	1058050	
42	75	35	4275-35-283	323219	1058059	
42	75	35	4275-35-284	323125	1057949	
42	75	35	4275-35-285	323023	1057850	
42	75	35	4275-35-286	323122	1057850	
42	75	35	4275-35-287	323124	1058154	
42	75	35	4275-35-288	322624	1057751	
42	75	35	4275-35-289	322724	1057749	
42	75	35	4275-35-29	320530	1059648	
42	75	35	4275-35-290	322822	1057752	
42	75	35	4275-35-291	322924	1057748	
42	75	35	4275-35-292	323022	1057748	
42	75	35	4275-35-293	322430	1057554	
42	75	35	4275-35-294	322332	1057451	
42	75	35	4275-35-295	322230	1057450	
42	75	35	4275-35-296	322122	1057553	
42	75	35	4275-35-297	321919	1057354	
42	75	35	4275-35-298	321813	1057255	
42	75	35	4275-35-299	321724	1057154	
42	75	35	4275-35-3	321349	1058036	
42	75	35	4275-35-30	320526	1058051	
42	75	35	4275-35-300	321622	1057253	
42	75	35	4275-35-301	321924	1058154	
42	75	35	4275-35-302	323320	1059158	
42	75	35	4275-35-303	323420	1059257	
42	75	35	4275-35-304	323224	1057949	
42	75	35	4275-35-305	322928	1057650	
42	75	35	4275-35-306	322829	1057650	
42	75	35	4275-35-307	322729	1057650	
42	75	35	4275-35-308	322628	1057651	
42	75	35	4275-35-309	322430	1057455	
42	75	35	4275-35-31	320524	1057851	
42	75	35	4275-35-310	322334	1057352	

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-311	322234	1057352	
42	75	35	4275-35-312	322119	1057462	
42	75	35	4275-35-313	322020	1057358	
42	75	35	4275-35-314	322018	1057257	
42	75	35	4275-35-315	321919	1057256	
42	75	35	4275-35-316	321832	1057154	
42	75	35	4275-35-317	321725	1057054	
42	75	35	4275-35-318	321626	1057151	
42	75	35	4275-35-319	322020	1057453	
42	75	35	4275-35-32	320724	1057851	
42	75	35	4275-35-320	322120	1057364	
42	75	35	4275-35-321	321932	1057155	
42	75	35	4275-35-322	321836	1057053	
42	75	35	4275-35-323	321326	1056653	
42	75	35	4275-35-324	320926	1056451	
42	75	35	4275-35-325	321626	1056953	
42	75	35	4275-35-326	321725	1056951	
42	75	35	4275-35-327	321827	1056954	
42	75	35	4275-35-328	321926	1057052	
42	75	35	4275-35-329	321624	1057052	
42	75	35	4275-35-33	320927	1057851	
42	75	35	4275-35-330	322028	1057152	
42	75	35	4275-35-331	322121	1057250	
42	75	35	4275-35-332	323222	1057853	
42	75	35	4275-35-333	322927	1057546	
42	75	35	4275-35-334	322823	1057551	
42	75	35	4275-35-335	322724	1057550	
42	75	35	4275-35-336	322623	1057552	
42	75	35	4275-35-337	322521	1057527	
42	75	35	4275-35-338	321524	1056951	
42	75	35	4275-35-339	322025	1057052	
42	75	35	4275-35-34	321125	1057852	
42	75	35	4275-35-340	321926	1056954	
42	75	35	4275-35-341	321526	1057055	
42	75	35	4275-35-342	321525	1056852	
42	75	35	4275-35-343	321626	1056852	
42	75	35	4275-35-344	321725	1056853	
42	75	35	4275-35-345	321827	1056852	
42	75	35	4275-35-346	321925	1056853	
42	75	35	4275-35-347	322025	1056954	
42	75	35	4275-35-348	322924	1057453	
42	75	35	4275-35-349	322825	1057451	
42	75	35	4275-35-35	321326	1057852	
42	75	35	4275-35-350	322724	1057453	

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-351	322624	1057454	
42	75	35	4275-35-352	322524	1057454	
42	75	35	4275-35-353	321424	1056852	
42	75	35	4275-35-354	321425	1056753	
42	75	35	4275-35-355	321526	1056752	
42	75	35	4275-35-356	321625	1056753	
42	75	35	4275-35-357	321725	1056753	
42	75	35	4275-35-358	321826	1056754	
42	75	35	4275-35-359	322623	1057351	
42	75	35	4275-35-36	321526	1057852	
42	75	35	4275-35-360	322724	1057354	
42	75	35	4275-35-361	322824	1057352	
42	75	35	4275-35-362	322523	1057349	
42	75	35	4275-35-363	321528	1056653	
42	75	35	4275-35-364	321627	1056654	
42	75	35	4275-35-365	321731	1056653	
42	75	35	4275-35-366	321428	1056653	
42	75	35	4275-35-367	325321	1055452	
42	75	35	4275-35-368	325343	1059499	
42	75	35	4275-35-369	323521	1058759	
42	75	35	4275-35-37	321725	1057852	
42	75	35	4275-35-370	323520	1058659	
42	75	35	4275-35-371	323522	1058558	
42	75	35	4275-35-372	321423	1057851	
42	75	35	4275-35-373	321529	1056553	
42	75	35	4275-35-374	321622	1056554	
42	75	35	4275-35-375	320726	1056952	
42	75	35	4275-35-376	320628	1057049	
42	75	35	4275-35-377	320627	1056947	
42	75	35	4275-35-378	320425	1057256	
42	75	35	4275-35-379	320326	1057246	
42	75	35	4275-35-38	321926	1057853	
42	75	35	4275-35-380	320537	1056039	
42	75	35	4275-35-381	324246	1056708	
42	75	35	4275-35-382	325325	1056657	
42	75	35	4275-35-383	324624	1057104	
42	75	35	4275-35-384	324642	1056702	
42	75	35	4275-35-385	323174	1058656	274.4
42	75	35	4275-35-386	323124	1058606	276
42	75	35	4275-35-387	323222	1058606	276
42	75	35	4275-35-388	323123	1058504	271
42	75	35	4275-35-389	322977	1058450	276.8
42	75	35	4275-35-39	322125	1057853	
42	75	35	4275-35-390	323123	1058405	257.8

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-391	323076	1058352	256
42	75	35	4275-35-392	323074	1058252	250
42	75	35	4275-35-393	323023	1058203	250
42	75	35	4275-35-394	322972	1058151	250
42	75	35	4275-35-395	323018	1058101	257.9
42	75	35	4275-35-396	322724	1058000	237
42	75	35	4275-35-397	322624	1058002	233
42	75	35	4275-35-398	322374	1058053	215.9
42	75	35	4275-35-399	322269	1058051	216
42	75	35	4275-35-4	320141	1057618	
42	75	35	4275-35-40	322325	1057854	
42	75	35	4275-35-400	322175	1058054	214
42	75	35	4275-35-4000	321824.4	1060399	761.4
42	75	35	4275-35-4001	321925.2	1060396	761.8
42	75	35	4275-35-4002	322029.1	1060401	
42	75	35	4275-35-4003	322025.9	1059997	
42	75	35	4275-35-4004	322193.3	1059894	
42	75	35	4275-35-4005	322346.1	1059785	
42	75	35	4275-35-4006	322424.3	1059558	
42	75	35	4275-35-4007	322526.8	1059560	
42	75	35	4275-35-4008	322624.6	1059558	
42	75	35	4275-35-4009	323270.9	1059465	
42	75	35	4275-35-401	322175	1057953	215.9
42	75	35	4275-35-4011	323485.2	1059572	
42	75	35	4275-35-4012	323580.4	1059561	
42	75	35	4275-35-4013	323719.1	1059167	
42	75	35	4275-35-4014	323567.4	1059167	
42	75	35	4275-35-4015	323120.8	1059062	
42	75	35	4275-35-4016	323123.9	1058964	
42	75	35	4275-35-4017	323081.9	1058568	
42	75	35	4275-35-4018	323171.7	1058522	
42	75	35	4275-35-4019	323075.6	1058422	
42	75	35	4275-35-402	322374	1057951	217
42	75	35	4275-35-4020	322993.1	1058420	
42	75	35	4275-35-4021	323025	1058311	
42	75	35	4275-35-4022	322977.8	1058210	
42	75	35	4275-35-4023	322777.8	1058207	299.9
42	75	35	4275-35-4024	322774.8	1058112	298.6
42	75	35	4275-35-4025	322775.2	1058009	763.5
42	75	35	4275-35-4026	323074.7	1058009	298.5
42	75	35	4275-35-4027	322972.9	1057856	298
42	75	35	4275-35-4028	322672.8	1057915	761.8
42	75	35	4275-35-4029	322473.7	1057908	297.9
42	75	35	4275-35-403	322474	1057951	213.9

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-4030	323026.8	1057547	300.9
42	75	35	4275-35-4031	322813	1056965	302.4
42	75	35	4275-35-4032	322465.8	1057109	762.8
42	75	35	4275-35-4033	322377.5	1057111	301.5
42	75	35	4275-35-4034	322378.5	1057308	298.5
42	75	35	4275-35-4035	322074.6	1057908	297.6
42	75	35	4275-35-4036	321774.1	1057813	298.4
42	75	35	4275-35-4037	321576	1057811	301
42	75	35	4275-35-4038	321776.3	1056912	301.9
42	75	35	4275-35-4039	321626.3	1056913	299
42	75	35	4275-35-404	322525	1057901	236.9
42	75	35	4275-35-4040	321324.8	1056708	300.5
42	75	35	4275-35-4041	321056.3	1056808	173
42	75	35	4275-35-4042	320675.4	1057809	300.5
42	75	35	4275-35-4043	320676.4	1056810	301.5
42	75	35	4275-35-4044	320571.6	1056760	301.9
42	75	35	4275-35-4045	320524.8	1056610	300.5
42	75	35	4275-35-4046	320628.6	1056358	299.4
42	75	35	4275-35-4048	320519	1055558	639.3
42	75	35	4275-35-4049	320195.5	1056735	301
42	75	35	4275-35-405	322572	1057853	217.9
42	75	35	4275-35-4050	322520.7	1058364	297.9
42	75	35	4275-35-4051C	320554	1056623	217.1
42	75	35	4275-35-4052C	322795.5	1058224	220.4
42	75	35	4275-35-4053	323089.2	1058308	299.6
42	75	35	4275-35-4054	322890.8	1058257	298.4
42	75	35	4275-35-4055	322789.1	1058259	297.4
42	75	35	4275-35-4056	322675.8	1058173	299
42	75	35	4275-35-4057	322061.5	1057821	298
42	75	35	4275-35-4058	321790	1056964	299.5
42	75	35	4275-35-4059	321710.3	1056987	298.9
42	75	35	4275-35-406	322474	1057851	203.9
42	75	35	4275-35-4060	321674.1	1056862	297.9
42	75	35	4275-35-4061	321361.8	1056856	297.4
42	75	35	4275-35-4062	321573	1056763	297
42	75	35	4275-35-4063	321776.4	1056812	149
42	75	35	4275-35-4064	321674.9	1056763	299
42	75	35	4275-35-4065	321715.8	1057220	298.5
42	75	35	4275-35-4066	320979.6	1057012	298.9
42	75	35	4275-35-4067	320678.1	1056957	298.9
42	75	35	4275-35-4068	321025.9	1057479	297.5
42	75	35	4275-35-4069	320877.9	1057713	298.5
42	75	35	4275-35-407	322376	1057853	216.9
42	75	35	4275-35-4070	320775.1	1057809	300

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-4071	320675.7	1057711	294.6
42	75	35	4275-35-4072	320126.2	1057302	295.6
42	75	35	4275-35-408	321827	1057802	215.9
42	75	35	4275-35-409	321877	1057752	213
42	75	35	4275-35-41	320326	1057651	
42	75	35	4275-35-410	322075	1057752	235
42	75	35	4275-35-411	322171	1057752	214.5
42	75	35	4275-35-412	322272	1057754	217.1
42	75	35	4275-35-413	322475	1057755	216.9
42	75	35	4275-35-4138	320571.8	1056485	298.9
42	75	35	4275-35-4139	320486.9	1056646	299.1
42	75	35	4275-35-414	322721	1057802	236.6
42	75	35	4275-35-4140	322129.6	1060401	762
42	75	35	4275-35-4141	322199.7	1057842	294.6
42	75	35	4275-35-4142	322644.6	1058087	302.5
42	75	35	4275-35-415	322772	1057749	232
42	75	35	4275-35-4154	321801	1057356	300.3
42	75	35	4275-35-4156	321961.2	1057215	294.6
42	75	35	4275-35-4157	320585.5	1056926	301.2
42	75	35	4275-35-416	322874	1057751	237.9
42	75	35	4275-35-417	322879	1057653	234.6
42	75	35	4275-35-418	322571	1057653	217
42	75	35	4275-35-419	322469	1057653	217.8
42	75	35	4275-35-42	320719	1057650	
42	75	35	4275-35-420	322525	1057702	218
42	75	35	4275-35-421	322428	1057705	212.8
42	75	35	4275-35-422	322380	1057652	212.9
42	75	35	4275-35-423	322275	1057642	211.9
42	75	35	4275-35-424	322175	1057651	210.9
42	75	35	4275-35-425	322075	1057654	237.9
42	75	35	4275-35-426	321825	1057702	213.9
42	75	35	4275-35-427	321924	1057601	216
42	75	35	4275-35-428	321769	1057552	216
42	75	35	4275-35-429	321863	1057552	216.8
42	75	35	4275-35-43	321127	1057652	
42	75	35	4275-35-430	322674	1057551	215.9
42	75	35	4275-35-431	322774	1057550	232.8
42	75	35	4275-35-432	322874	1057549	236.9
42	75	35	4275-35-433	321873	1057453	215
42	75	35	4275-35-434	321917	1057405	214.8
42	75	35	4275-35-435	321832	1057105	216
42	75	35	4275-35-436	321724	1057104	216
42	75	35	4275-35-437	321781	1057053	216.9
42	75	35	4275-35-438	321881	1057052	216.9

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-439	321830	1057002	217.9
42	75	35	4275-35-44	321725	1057652	
42	75	35	4275-35-440	321879	1056953	216
42	75	35	4275-35-441	321778	1057153	211
42	75	35	4275-35-442	321777	1057252	218
42	75	35	4275-35-443	321724	1057405	217
42	75	35	4275-35-444	321721	1057602	218
42	75	35	4275-35-445	321978	1057951	232.6
42	75	35	4275-35-446	322072	1058048	216
42	75	35	4275-35-447	323174	1058557	275.9
42	75	35	4275-35-448	323173	1058454	272.9
42	75	35	4275-35-449	322674	1058000	236
42	75	35	4275-35-45	320128	1057451	
42	75	35	4275-35-450	322571	1058005	236.9
42	75	35	4275-35-451	322527	1057801	235
42	75	35	4275-35-452	322424	1057803	212.9
42	75	35	4275-35-453	322729	1057604	217
42	75	35	4275-35-454	322474	1057546	217
42	75	35	4275-35-455	322525	1057606	246.9
42	75	35	4275-35-456	322323	1057898	216.9
42	75	35	4275-35-457	322240	1057905	217
42	75	35	4275-35-458	321925	1057901	215
42	75	35	4275-35-459	321925	1058005	217.9
42	75	35	4275-35-46	320326	1057451	
42	75	35	4275-35-460	322217	1058018	215
42	75	35	4275-35-461	322420	1058004	217
42	75	35	4275-35-462	322421	1057899	213
42	75	35	4275-35-463	322378	1057754	209.7
42	75	35	4275-35-464	322327	1057705	217.9
42	75	35	4275-35-465	322225	1057703	217.9
42	75	35	4275-35-466	322030	1057705	200
42	75	35	4275-35-467	322123	1058004	213
42	75	35	4275-35-468	322127	1057903	212
42	75	35	4275-35-469	322327	1058003	200
42	75	35	4275-35-47	320524	1057452	
42	75	35	4275-35-470	321769	1057601	217
42	75	35	4275-35-471	321818	1057603	216
42	75	35	4275-35-472	321873	1057602	216
42	75	35	4275-35-473	321771	1057502	216
42	75	35	4275-35-474	321867	1057500	217
42	75	35	4275-35-475	321819	1057500	214.9
42	75	35	4275-35-476	321773	1057751	209.9004
42	75	35	4275-35-477	322623	1057600	215
42	75	35	4275-35-478	322573	1057603	210

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-479	322622	1057702	216
42	75	35	4275-35-48	320721	1057450	
42	75	35	4275-35-480	322573	1057701	217
42	75	35	4275-35-481	322476	1057702	216
42	75	35	4275-35-482	322575	1057801	198
42	75	35	4275-35-483	322475	1057802	203
42	75	35	4275-35-484	322376	1057803	217
42	75	35	4275-35-485	322375	1057901	217
42	75	35	4275-35-486	322624	1058102	250
42	75	35	4275-35-487	322672	1058105	249.5
42	75	35	4275-35-488	322677	1057599	215.9
42	75	35	4275-35-489	322776	1057600	209.9
42	75	35	4275-35-49	320926	1057452	
42	75	35	4275-35-490	322826	1057601	216
42	75	35	4275-35-491	322774	1057652	216.9
42	75	35	4275-35-492	322679	1057652	216.9
42	75	35	4275-35-493	322677	1057699	216.8
42	75	35	4275-35-494	322728	1057699	209
42	75	35	4275-35-495	322777	1057699	216
42	75	35	4275-35-496	322828	1057700	217
42	75	35	4275-35-497	322877	1057698	213.9
42	75	35	4275-35-498	322673	1057751	213.9
42	75	35	4275-35-499	322573	1057751	217
42	75	35	4275-35-5	321336	1057619	
42	75	35	4275-35-50	321125	1057451	
42	75	35	4275-35-500	322619	1057800	216.7
42	75	35	4275-35-501	322674	1057801	212.9
42	75	35	4275-35-502	322674	1057951	218
42	75	35	4275-35-503	322522	1058005	216
42	75	35	4275-35-504	322471	1058005	213.9
42	75	35	4275-35-505	322474	1058052	214.8
42	75	35	4275-35-506	321779	1057003	210
42	75	35	4275-35-507	321881	1057003	216
42	75	35	4275-35-508	321929	1057104	215
42	75	35	4275-35-509	321880	1057104	217
42	75	35	4275-35-51	322325	1058054	
42	75	35	4275-35-510	321778	1057104	215.9
42	75	35	4275-35-511	321885	1057153	216
42	75	35	4275-35-512	321926	1057204	215.9
42	75	35	4275-35-513	321878	1057204	217
42	75	35	4275-35-514	321825	1057211	215.9
42	75	35	4275-35-515	321779	1057203	215.6
42	75	35	4275-35-516	321873	1057254	215.9
42	75	35	4275-35-517	321919	1057305	217

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-518	321871	1057406	200
42	75	35	4275-35-519	321819	1057412	216.9
42	75	35	4275-35-52	322324	1058254	
42	75	35	4275-35-520	321773	1057457	210
42	75	35	4275-35-521	322074	1058007	211.8
42	75	35	4275-35-522	321927	1057702	215
42	75	35	4275-35-523	321876	1057703	216.9
42	75	35	4275-35-524	322175	1057703	213.9
42	75	35	4275-35-525	322187	1057806	212
42	75	35	4275-35-526	322177	1057901	215
42	75	35	4275-35-527	322073	1057707	216
42	75	35	4275-35-528C	322892	1057976	253
42	75	35	4275-35-529C	321720	1057010	216
42	75	35	4275-35-53	322324	1058453	
42	75	35	4275-35-530C	322573	1057553	201.9
42	75	35	4275-35-531C	323074	1058454	274
42	75	35	4275-35-532C	321726	1057303	236.9
42	75	35	4275-35-533C	321979	1057704	206
42	75	35	4275-35-534C	322577	1058051	233
42	75	35	4275-35-535C	321828	1057304	216.9
42	75	35	4275-35-536C	321777	1057303	217
42	75	35	4275-35-537C	323027	1058504	295
42	75	35	4275-35-538C	322574	1058153	237
42	75	35	4275-35-539C	322575	1058104	231
42	75	35	4275-35-54	322324	1058654	
42	75	35	4275-35-540C	321979	1057755	211.9
42	75	35	4275-35-541C	323273	1058505	276
42	75	35	4275-35-542C	321875	1057305	214
42	75	35	4275-35-543C	323023	1057901	214
42	75	35	4275-35-544C	323272	1058555	275
42	75	35	4275-35-545C	323272	1058607	270
42	75	35	4275-35-546C	322986	1058560	292
42	75	35	4275-35-547C	321977	1057803	215.8
42	75	35	4275-35-548C	322574	1058206	233
42	75	35	4275-35-549C	322971	1057901	231.9
42	75	35	4275-35-55	322323	1058853	
42	75	35	4275-35-550C	321978	1057902	212
42	75	35	4275-35-551C	323273	1058656	276
42	75	35	4275-35-552C	323271	1058452	270.9
42	75	35	4275-35-553C	322575	1058253	233
42	75	35	4275-35-554C	321981	1057654	213.9
42	75	35	4275-35-555C	323073	1057903	255
42	75	35	4275-35-556C	321975	1058004	211.8
42	75	35	4275-35-557C	322774	1057801	

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-558	322826	1057800	224.9
42	75	35	4275-35-559C	321974	1058052	
42	75	35	4275-35-56	322524	1058853	
42	75	35	4275-35-560C	322925	1057797	
42	75	35	4275-35-561	320121.4	1057059	
42	75	35	4275-35-562	320320	1057046	257.9
42	75	35	4275-35-563	320321	1056649	237.9
42	75	35	4275-35-564	320718	1056649	238
42	75	35	4275-35-565	320920.1	1056059	
42	75	35	4275-35-566	320071.9	1055659	
42	75	35	4275-35-567	320518.9	1055658	
42	75	35	4275-35-568C	321981	1057603	
42	75	35	4275-35-569C	322576.1	1058317	
42	75	35	4275-35-57	322522	1059253	
42	75	35	4275-35-570C	322907	1058427	
42	75	35	4275-35-571C	322575	1058353	
42	75	35	4275-35-572C	322925	1058607	
42	75	35	4275-35-573C	322909	1058477	
42	75	35	4275-35-574C	322903	1058526	
42	75	35	4275-35-575C	322573	1058403	
42	75	35	4275-35-576C	322872	1058660	
42	75	35	4275-35-577C	321973	1058101	
42	75	35	4275-35-578C	321671	1057802	253.9
42	75	35	4275-35-579C	321877	1057808	
42	75	35	4275-35-58	322922	1060052	
42	75	35	4275-35-580C	322125	1057808	206.9
42	75	35	4275-35-581C	322275	1057808	207.9
42	75	35	4275-35-582C	322275	1057953	204
42	75	35	4275-35-583C	321840	1057527	216
42	75	35	4275-35-584C	321968	1057306	211.8
42	75	35	4275-35-585C	321908	1057129	214.9
42	75	35	4275-35-586C	321731	1056903	215
42	75	35	4275-35-587C	321725	1056803	213.9
42	75	35	4275-35-588C	322573	1057902	233.9
42	75	35	4275-35-589C	322726	1057902	228.9
42	75	35	4275-35-59	323721	1060053	
42	75	35	4275-35-590C	322873	1057900	252.9
42	75	35	4275-35-591C	322724	1057501	214
42	75	35	4275-35-592C	322773	1058354	252.9
42	75	35	4275-35-593C	323074	1058202	250.8
42	75	35	4275-35-594C	323123	1058704	275.8
42	75	35	4275-35-595	323072	1058656	269
42	75	35	4275-35-596	323373	1058454	273.9
42	75	35	4275-35-597	323324	1058403	275

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-598	323371	1058556	277.8
42	75	35	4275-35-599	323123	1058302	296.9
42	75	35	4275-35-6	321324	1060450	
42	75	35	4275-35-60	323319	1060056	
42	75	35	4275-35-600	322874	1058454	273
42	75	35	4275-35-601	323123	1058107	274
42	75	35	4275-35-602	323169	1058059	251.9
42	75	35	4275-35-603	323177	1057947	252
42	75	35	4275-35-604	323124	1057897	251
42	75	35	4275-35-605	323072	1057850	231
42	75	35	4275-35-606	322927	1057698	215
42	75	35	4275-35-607	322824	1057501	213.9
42	75	35	4275-35-608	322723	1057401	194.9
42	75	35	4275-35-609	322622	1057405	192.8
42	75	35	4275-35-61	322722	1059653	
42	75	35	4275-35-610	322478	1057455	197.8
42	75	35	4275-35-611	322525	1058203	
42	75	35	4275-35-612	322473	1058155	236
42	75	35	4275-35-613	322229	1058099	203.8
42	75	35	4275-35-614	322024	1058102	211.9
42	75	35	4275-35-615	321873	1058049	213.8
42	75	35	4275-35-616	321875	1057947	213
42	75	35	4275-35-617	321825	1057898	216.8
42	75	35	4275-35-618	321725	1057905	213
42	75	35	4275-35-619	321625	1057901	205.9
42	75	35	4275-35-62	322922	1059253	
42	75	35	4275-35-620	321524	1057901	211.9
42	75	35	4275-35-621	321474	1057850	215
42	75	35	4275-35-622	321524	1057702	213.9
42	75	35	4275-35-623	321576	1057651	210.9
42	75	35	4275-35-624	321627	1057601	212.9
42	75	35	4275-35-625	321677	1057500	211.8
42	75	35	4275-35-626	321675	1057351	213.9
42	75	35	4275-35-627	321676	1057254	214
42	75	35	4275-35-628	321674	1057149	212.9
42	75	35	4275-35-629	321623	1057100	212
42	75	35	4275-35-63	322924	1058854	
42	75	35	4275-35-630	321576	1057053	214.9
42	75	35	4275-35-631	321576	1056952	213.8
42	75	35	4275-35-632	321474	1056852	211.7
42	75	35	4275-35-633	321475	1056753	213.9
42	75	35	4275-35-634	321527	1056701	214.9
42	75	35	4275-35-635	321776	1056755	214.7
42	75	35	4275-35-636	321876	1056850	212

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-637	321874	1056904	215
42	75	35	4275-35-638	321976	1057051	213
42	75	35	4275-35-639	321979	1057151	211.9
42	75	35	4275-35-64	320929	1057071	
42	75	35	4275-35-640	321675	1057303	215.9
42	75	35	4275-35-641	321675	1057199	216
42	75	35	4275-35-642	321674	1057098	214
42	75	35	4275-35-643	321575	1057005	215
42	75	35	4275-35-644	321525	1056912	
42	75	35	4275-35-645	321870	1056800	212
42	75	35	4275-35-646	321923	1057002	210
42	75	35	4275-35-647	321976	1057102	212.9
42	75	35	4275-35-648	322383	1057454	193.9
42	75	35	4275-35-649	322379	1057547	197.9
42	75	35	4275-35-65	321326	1057286	
42	75	35	4275-35-650	322480	1057506	197
42	75	35	4275-35-651	322530	1057399	192.9
42	75	35	4275-35-652	321826	1057994	
42	75	35	4275-35-653	321873	1058000	209
42	75	35	4275-35-654	321676	1057653	216.9
42	75	35	4275-35-655	321873	1058099	206
42	75	35	4275-35-656	321924	1058097	180
42	75	35	4275-35-657	322273	1058101	210.9
42	75	35	4275-35-658	323075	1058151	256.9
42	75	35	4275-35-659	321774	1057901	217
42	75	35	4275-35-66	323319	1060453	
42	75	35	4275-35-660	321775	1057948	235.9
42	75	35	4275-35-661	323172	1058000	256.9
42	75	35	4275-35-662	323221	1058002	257
42	75	35	4275-35-663	321675	1057400	189
42	75	35	4275-35-664	322673	1057400	192
42	75	35	4275-35-665	322775	1057452	214.9
42	75	35	4275-35-666	322878	1057603	217.9
42	75	35	4275-35-667	322975	1057749	216.9
42	75	35	4275-35-668	323026	1057803	216.9
42	75	35	4275-35-669	322174	1058102	213.8
42	75	35	4275-35-67	323720	1060453	
42	75	35	4275-35-670	322073	1058101	215.9
42	75	35	4275-35-671C	322427	1058105	233
42	75	35	4275-35-672C	323074	1058202	262
42	75	35	4275-35-673C	323038	1058606	281.9
42	75	35	4275-35-674C	321472	1057751	
42	75	35	4275-35-675	321475	1057802	218
42	75	35	4275-35-676	321575	1057903	217.8

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-677	321575	1057954	236
42	75	35	4275-35-678	321673	1057952	235.8
42	75	35	4275-35-679	321673	1057901	216.7
42	75	35	4275-35-68	323321	1059654	
42	75	35	4275-35-680	321972	1057552	216.9
42	75	35	4275-35-681	321921	1057504	216.8
42	75	35	4275-35-682	321972	1057404	206.7
42	75	35	4275-35-683	321968	1057356	217.9
42	75	35	4275-35-684	322018	1057308	216.8
42	75	35	4275-35-685	321976	1057207	217.9
42	75	35	4275-35-686	322175	1057458	
42	75	35	4275-35-687	322329	1057501	208.8
42	75	35	4275-35-688	322378	1057500	
42	75	35	4275-35-689	322431	1057504	
42	75	35	4275-35-69	322933	1058453	
42	75	35	4275-35-690	322976	1057698	217
42	75	35	4275-35-691	323069	1057779	217
42	75	35	4275-35-692	323174	1057898	237
42	75	35	4275-35-693	323173	1058111	255.8
42	75	35	4275-35-694	323123	1058205	305.9
42	75	35	4275-35-695	323173	1058304	276.8
42	75	35	4275-35-696	323373	1058507	276.9
42	75	35	4275-35-697	323425	1058504	276.9
42	75	35	4275-35-698	323173	1058158	256.9
42	75	35	4275-35-699	323275	1058356	274.9
42	75	35	4275-35-7	320929	1060248	
42	75	35	4275-35-70	320929	1056853	
42	75	35	4275-35-700	323275	1058406	276.9
42	75	35	4275-35-701	323420	1058607	277
42	75	35	4275-35-702	323373	1058608	276.9
42	75	35	4275-35-703	323373	1058655	277
42	75	35	4275-35-704	323324	1058705	277
42	75	35	4275-35-705	323272	1058706	277
42	75	35	4275-35-706	323221	1058707	276.9
42	75	35	4275-35-707	323170	1058700	270.8
42	75	35	4275-35-708	322979	1058609	281.5
42	75	35	4275-35-709	322824	1058402	256.9
42	75	35	4275-35-71	321125	1057053	
42	75	35	4275-35-710	322725	1058403	273.9
42	75	35	4275-35-711	322675	1058303	255.9
42	75	35	4275-35-712	322626	1058304	254.8
42	75	35	4275-35-713	322477	1058205	254.8
42	75	35	4275-35-714	322376	1058105	214
42	75	35	4275-35-715	322325	1058105	214

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-716	322273	1058157	215
42	75	35	4275-35-717	322173	1058155	234.8
42	75	35	4275-35-718	322123	1058105	217
42	75	35	4275-35-719	322075	1058154	233.9
42	75	35	4275-35-72	320729	1057050	
42	75	35	4275-35-720	321975	1058154	236.9
42	75	35	4275-35-721	321475	1057901	216.9
42	75	35	4275-35-722	321423	1057802	216
42	75	35	4275-35-723	321474	1057701	216.9
42	75	35	4275-35-724	321579	1057597	214.6
42	75	35	4275-35-725	321628	1057502	215.9
42	75	35	4275-35-726	321627	1057400	212.7
42	75	35	4275-35-727	321572	1057450	210.7
42	75	35	4275-35-728	321677	1057452	217
42	75	35	4275-35-729	321575	1056653	215
42	75	35	4275-35-73	320927	1057154	
42	75	35	4275-35-730	321678	1056655	213.9
42	75	35	4275-35-731	321776	1056706	213.9
42	75	35	4275-35-732	321828	1056702	216
42	75	35	4275-35-733	321877	1056754	214.9
42	75	35	4275-35-734	321927	1056901	216.9
42	75	35	4275-35-735	322020	1057200	212.9
42	75	35	4275-35-736	322070	1057300	175.9
42	75	35	4275-35-737	322066	1057360	216.9
42	75	35	4275-35-738	322119	1057413	217.9
42	75	35	4275-35-739	322067	1057412	214.5
42	75	35	4275-35-74	321125	1057253	
42	75	35	4275-35-740	322020	1057407	217
42	75	35	4275-35-741	322069	1057461	212.9
42	75	35	4275-35-742	321970	1057453	218
42	75	35	4275-35-743	322120	1057510	208.7
42	75	35	4275-35-744	322070	1057506	215.9
42	75	35	4275-35-745	322019	1057505	216
42	75	35	4275-35-746	321970	1057501	218
42	75	35	4275-35-747	322070	1057556	215
42	75	35	4275-35-748	322072	1057604	214.9
42	75	35	4275-35-749	322122	1057603	211.7
42	75	35	4275-35-75	323518	1059255	
42	75	35	4275-35-750	322170	1057605	217
42	75	35	4275-35-751	322120	1057700	213.9
42	75	35	4275-35-752	322275	1057706	209
42	75	35	4275-35-753	322377	1057704	209.8
42	75	35	4275-35-754	322328	1057604	212
42	75	35	4275-35-755	322379	1057599	215

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-756	322432	1057605	213.9
42	75	35	4275-35-757	322481	1057603	215
42	75	35	4275-35-758	322026	1057102	211
42	75	35	4275-35-759	322167	1057420	211.8
42	75	35	4275-35-76	323718	1059063	
42	75	35	4275-35-760	322280	1057451	213.9
42	75	35	4275-35-761	322331	1057400	213
42	75	35	4275-35-762	322477	1057406	190
42	75	35	4275-35-763	322520	1057500	213.6
42	75	35	4275-35-764	322576	1057452	197.9
42	75	35	4275-35-765	322572	1057401	197
42	75	35	4275-35-766	322674	1057453	211
42	75	35	4275-35-767	322770	1057400	216
42	75	35	4275-35-768	322823	1057400	216
42	75	35	4275-35-769	323172	1058209	276
42	75	35	4275-35-77	323520	1058958	
42	75	35	4275-35-770	323172	1058258	269.9
42	75	35	4275-35-771	323220	1058306	242.9
42	75	35	4275-35-772	323471	1058607	274.9
42	75	35	4275-35-773	323472	1058660	270
42	75	35	4275-35-774	323474	1058708	270
42	75	35	4275-35-775	323423	1058700	274.9
42	75	35	4275-35-776	323374	1058704	226
42	75	35	4275-35-777	323273	1058754	271.9
42	75	35	4275-35-778	323171	1058754	271
42	75	35	4275-35-779	323073	1058705	274
42	75	35	4275-35-78	320126	1057343	
42	75	35	4275-35-780	323170	1058606	272.7
42	75	35	4275-35-781	323077	1058606	274
42	75	35	4275-35-782	322976	1058499	275.9
42	75	35	4275-35-783	322775	1058452	272.9
42	75	35	4275-35-784	322778	1058401	274
42	75	35	4275-35-785	322677	1058402	274.8
42	75	35	4275-35-786	322725	1058301	255
42	75	35	4275-35-787	322677	1058254	254.8
42	75	35	4275-35-788	322625	1058202	235
42	75	35	4275-35-789	323175	1058357	273.9
42	75	35	4275-35-79	323421	1058858	
42	75	35	4275-35-790	323224	1058403	273
42	75	35	4275-35-791	321875	1058156	235.9
42	75	35	4275-35-792	321823	1058100	236
42	75	35	4275-35-793	321776	1057987	235
42	75	35	4275-35-794	321475	1057953	214.9
42	75	35	4275-35-795	321427	1057903	215

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-796	321371	1057849	215
42	75	35	4275-35-797	321373	1057803	216
42	75	35	4275-35-798	321525	1057601	214.9
42	75	35	4275-35-799	321578	1057548	213.4
42	75	35	4275-35-8	321724	1059451	
42	75	35	4275-35-80	320524	1057552	
42	75	35	4275-35-800	321678	1057550	215
42	75	35	4275-35-801	321676	1057602	215.9
42	75	35	4275-35-802	321620	1057000	214.9
42	75	35	4275-35-803	321578	1056904	216
42	75	35	4275-35-804	321525	1056803	215
42	75	35	4275-35-805	321576	1056702	214.9
42	75	35	4275-35-806	321624	1056701	
42	75	35	4275-35-807	321676	1056698	214
42	75	35	4275-35-808	321727	1056702	216
42	75	35	4275-35-809	321829	1056802	213
42	75	35	4275-35-81	320427	1057652	
42	75	35	4275-35-810	322024	1057604	213.9
42	75	35	4275-35-811	322069	1057254	216
42	75	35	4275-35-812	322071	1057202	211.9
42	75	35	4275-35-813	322877	1058495	296.9
42	75	35	4275-35-814	322874	1058353	274.9
42	75	35	4275-35-815	322776	1058303	254.9
42	75	35	4275-35-816	322824	1058297	275
42	75	35	4275-35-817	322374	1058154	231.7
42	75	35	4275-35-818	322220	1057600	217.9
42	75	35	4275-35-819	322269	1057610	208
42	75	35	4275-35-82	323325	1058755	
42	75	35	4275-35-820	322277	1057548	215.9
42	75	35	4275-35-821	322177	1057554	214
42	75	35	4275-35-822	322278	1057500	210.8
42	75	35	4275-35-823	322229	1057498	216
42	75	35	4275-35-824	322179	1057502	216.7
42	75	35	4275-35-825	322279	1057398	211.9
42	75	35	4275-35-826	322378	1057401	213.9
42	75	35	4275-35-827	322573	1057351	196
42	75	35	4275-35-828	322776	1057355	197
42	75	35	4275-35-829	322875	1057350	215
42	75	35	4275-35-83	323221	1058657	
42	75	35	4275-35-830	322820	1057300	190.9
42	75	35	4275-35-831	322870	1057400	215
42	75	35	4275-35-832	321475	1056801	209.6
42	75	35	4275-35-833	321472	1056903	214
42	75	35	4275-35-834	321675	1057053	210.9

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-835	323272	1058319	274.9
42	75	35	4275-35-836	323223	1058258	271.9
42	75	35	4275-35-837	323224	1058208	274
42	75	35	4275-35-838	323222	1058158	276
42	75	35	4275-35-839	321820	1058150	235
42	75	35	4275-35-84	323322	1058556	
42	75	35	4275-35-840	321427	1057953	215
42	75	35	4275-35-841	321377	1057907	214.5
42	75	35	4275-35-842	321371	1057754	215.9
42	75	35	4275-35-843	321322	1057803	214.9
42	75	35	4275-35-844	322860	1058451	270.9
42	75	35	4275-35-845	322728	1058503	272.8
42	75	35	4275-35-846	322774	1058503	274.7
42	75	35	4275-35-847	322780	1057305	195
42	75	35	4275-35-848	322826	1057251	197
42	75	35	4275-35-849	322875	1057298	215
42	75	35	4275-35-85	323125	1058556	
42	75	35	4275-35-850	322925	1057346	216
42	75	35	4275-35-851	322926	1057497	215
42	75	35	4275-35-852	322873	1057500	217
42	75	35	4275-35-853	322977	1057541	214
42	75	35	4275-35-854	322927	1057596	234
42	75	35	4275-35-855C	322215	1057426	
42	75	35	4275-35-856	320523	1056651	234.9
42	75	35	4275-35-857	322820	1056650	235
42	75	35	4275-35-858	321026	1057051	234.9
42	75	35	4275-35-859	320220	1057048	231.8
42	75	35	4275-35-86	320628	1057851	
42	75	35	4275-35-860	320423	1057047	232
42	75	35	4275-35-861	320324	1057145	227.8
42	75	35	4275-35-862	320125	1056856	234
42	75	35	4275-35-863	324122	1056655	295
42	75	35	4275-35-864	324113	1060453	312
42	75	35	4275-35-865	324923	1060453	314.6
42	75	35	4275-35-866	322281	1057351	213
42	75	35	4275-35-867	322182	1057353	211.9
42	75	35	4275-35-868	322327	1057250	235
42	75	35	4275-35-869	322319	1057048	229
42	75	35	4275-35-87	320827	1057851	
42	75	35	4275-35-870	322523	1057251	232.7
42	75	35	4275-35-871	320121	1056952	237.8
42	75	35	4275-35-872	320126	1056757	199.9
42	75	35	4275-35-873	320415	1056651	232.6
42	75	35	4275-35-874	320626	1056653	232

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-875	320720	1056753	230.9
42	75	35	4275-35-876	320830	1056854	233
42	75	35	4275-35-877	320828	1056948	233.9
42	75	35	4275-35-878	321528	1056602	213.9
42	75	35	4275-35-879	321623	1056602	212.9
42	75	35	4275-35-88	323222	1058454	
42	75	35	4275-35-880	321673	1056601	211.8
42	75	35	4275-35-881	322924	1057294	213.9
42	75	35	4275-35-882	322729	1057308	194.9
42	75	35	4275-35-883	322784	1057257	194.9
42	75	35	4275-35-884	322734	1057260	188.9
42	75	35	4275-35-885	322876	1057247	194
42	75	35	4275-35-886	322929	1057396	215
42	75	35	4275-35-887	322976	1057493	213.9
42	75	35	4275-35-888	322975	1057442	215
42	75	35	4275-35-889	323184	1057486	234.9
42	75	35	4275-35-89	323222	1058599	
42	75	35	4275-35-890	323180	1057701	274.9
42	75	35	4275-35-891	323375	1057898	273.9
42	75	35	4275-35-892	323176	1058802	273.9
42	75	35	4275-35-893	323224	1058805	274.9
42	75	35	4275-35-894	323273	1058854	274.9
42	75	35	4275-35-895	323323	1058805	273.9
42	75	35	4275-35-896	323274	1058806	275
42	75	35	4275-35-897	321378	1057954	208.8
42	75	35	4275-35-898	321329	1057911	214.9
42	75	35	4275-35-899	321370	1057705	209.9
42	75	35	4275-35-9	321327	1058848	
42	75	35	4275-35-90	323813	1058457	
42	75	35	4275-35-900	321331	1057705	215
42	75	35	4275-35-901	320831	1056758	
42	75	35	4275-35-902	320621	1056753	234.9
42	75	35	4275-35-903	320519	1056752	234.8
42	75	35	4275-35-904	320420	1056746	235.9
42	75	35	4275-35-905	320408	1056551	234.2
42	75	35	4275-35-906	320523	1056550	232.9
42	75	35	4275-35-907	320631	1056552	234.9
42	75	35	4275-35-908	322877	1057197	195
42	75	35	4275-35-909	322828	1057201	195
42	75	35	4275-35-91	325327	1060516	
42	75	35	4275-35-910	322779	1057203	194
42	75	35	4275-35-911	322924	1057245	195.9
42	75	35	4275-35-912	320622	1056846	232.8
42	75	35	4275-35-913	320426	1056853	232

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-914	320322	1056944	234.9
42	75	35	4275-35-915	320322	1056748	230
42	75	35	4275-35-916	320224	1056853	235
42	75	35	4275-35-917	321473	1058004	214.9
42	75	35	4275-35-918	321428	1058006	214.6
42	75	35	4275-35-919	321378	1058007	214.5
42	75	35	4275-35-92	325310	1058439	
42	75	35	4275-35-920	321329	1057955	214.9
42	75	35	4275-35-921	321674	1058003	235
42	75	35	4275-35-922	321723	1058003	234.8
42	75	35	4275-35-923	321774	1058049	235
42	75	35	4275-35-924	323222	1058904	272.8
42	75	35	4275-35-925	323174	1058857	273.9
42	75	35	4275-35-926	323325	1058904	275.9
42	75	35	4275-35-927	323273	1058902	273.9
42	75	35	4275-35-928	323375	1058854	276.9
42	75	35	4275-35-929	322970	1057600	235.9
42	75	35	4275-35-93	323323	1058856	
42	75	35	4275-35-930	322978	1057638	236.8
42	75	35	4275-35-931	321420	1056800	216.9
42	75	35	4275-35-932	321421	1056905	211.9
42	75	35	4275-35-933	321469	1056954	215.7
42	75	35	4275-35-934	320874	1056949	236.8
42	75	35	4275-35-935	320776	1056949	236.9
42	75	35	4275-35-936	320729	1056903	236
42	75	35	4275-35-937	320870	1056850	235.8
42	75	35	4275-35-938	320679	1056848	235
42	75	35	4275-35-939	320522	1056848	
42	75	35	4275-35-94	323320	1059254	
42	75	35	4275-35-940	320477	1056847	
42	75	35	4275-35-941	320426	1056900	239
42	75	35	4275-35-942	320321	1056894	
42	75	35	4275-35-943	320322	1056797	
42	75	35	4275-35-944	320120	1056900	239
42	75	35	4275-35-945	320123	1056808	239.8
42	75	35	4275-35-946	320223	1056804	239
42	75	35	4275-35-947	320221	1056898	
42	75	35	4275-35-948	320721	1056702	237.8
42	75	35	4275-35-949	320672	1056653	237.8
42	75	35	4275-35-95	323925	1059455	
42	75	35	4275-35-950	320574	1056655	237.7
42	75	35	4275-35-951	320469	1056653	
42	75	35	4275-35-952	320367	1056646	237
42	75	35	4275-35-953	320354	1056550	239

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-954	320402	1056501	238
42	75	35	4275-35-955	320523	1056501	235.9
42	75	35	4275-35-956	320631	1056501	238
42	75	35	4275-35-957	320684	1056553	239
42	75	35	4275-35-958	322728	1057209	198
42	75	35	4275-35-959	322719	1057156	197
42	75	35	4275-35-96	324518	1059658	
42	75	35	4275-35-960	322768	1057154	197
42	75	35	4275-35-961	322820	1057150	197
42	75	35	4275-35-962	322869	1057150	195
42	75	35	4275-35-963	322917	1057156	213.9
42	75	35	4275-35-964	322916	1057203	215
42	75	35	4275-35-965	323022	1057443	216.9
42	75	35	4275-35-966	323026	1057394	214
42	75	35	4275-35-967	323020	1057600	236.8
42	75	35	4275-35-968	323020	1057650	
42	75	35	4275-35-969	320970	1057000	237
42	75	35	4275-35-97	324520	1060054	
42	75	35	4275-35-970	320920	1057000	236
42	75	35	4275-35-971	320870	1057000	235.9
42	75	35	4275-35-972	320780	1057000	234
42	75	35	4275-35-973	320830	1056901	235
42	75	35	4275-35-974	320826	1056805	240.9
42	75	35	4275-35-975	320775	1056756	240.8
42	75	35	4275-35-976	320679	1056897	236
42	75	35	4275-35-977	320621	1056795	237
42	75	35	4275-35-978	320516	1056799	236
42	75	35	4275-35-979	320469	1056749	229.9
42	75	35	4275-35-98	322924	1058252	
42	75	35	4275-35-980	320420	1056801	241.9
42	75	35	4275-35-981	320372	1056797	230
42	75	35	4275-35-982	320375	1056852	238
42	75	35	4275-35-983	320275	1056853	252.4
42	75	35	4275-35-984	320173	1056805	237.8
42	75	35	4275-35-985	320073	1056809	235.9
42	75	35	4275-35-986	320075	1056859	236.9
42	75	35	4275-35-987	320470	1056707	232.9
42	75	35	4275-35-988	320666	1056705	236.4
42	75	35	4275-35-989	322968	1057153	216.9
42	75	35	4275-35-99	323520	1058857	
42	75	35	4275-35-990	322918	1057109	218
42	75	35	4275-35-991	322965	1057104	216
42	75	35	4275-35-992	322861	1057109	197.9
42	75	35	4275-35-993	322814	1057107	240.9

Table [illegible] Drill Holes

TWN	RNG	SECT	HOLE NO	EAST COORD	NORTH COORD	TOTAL LOGGED DEPTH
42	75	35	4275-35-994	322764	1057105	188
42	75	35	4275-35-995	322712	1057106	195.9
42	75	35	4275-35-996	322663	1057102	188.9
42	75	35	4275-35-997	322671	1057151	186.9
42	75	35	4275-35-998	322977	1057397	217
42	75	35	4275-35-999	320175	1056754	236
42	75	35	4275-35-KM1	323861	1059568	
42	75	35	4275-35-KM10	322121	1060188	
42	75	35	4275-35-KM11	322026	1060483	
42	75	35	4275-35-KM12	322027	1059891	
42	75	35	4275-35-KM2	322291	1060188	
42	75	35	4275-35-KM3	323757	1057163	
42	75	35	4275-35-KM4	322304	1060477	
42	75	35	4275-35-KM5	322347	1059875	
42	75	35	4275-35-KM6	322014	1060194	
42	75	35	4275-35-KM7	322615	1060200	
42	75	35	4275-35-KM8	321100	1059298	
42	75	35	4275-35-KM9	321907	1060193	
42	75	35	4275-35-MW-1	320102.4	1057971	278.5
42	75	35	4275-35-MW-10	320117.9	1059390	281.3
42	75	35	4275-35-MW-2	322636.5	1057719	201.4
42	75	35	4275-35-MW-5	321453.1	1056691	217.6
42	75	35	4275-35-MW-6	323791.4	1058288	282.1
42	75	35	4275-35-MW-7	322536.9	1056311	198.4
42	75	35	4275-35-OMW-1	320091.8	1057972	179.5
42	75	35	4275-35-OMW-2	322625.8	1057719	100.4
42	75	35	4275-35-PW-1	320194.5	1057997	275.4
42	75	35	4275-35-UMW-1	320113.3	1057971	339.3
42	75	35	4275-35-UMW-2	322645	1057720	280.3

THIS PAGE IS AN OVERSIZED DRAWING OR FIGURE,

THAT CAN BE VIEWED AT THE RECORD TITLED: DRAWING NO.: FIGURE 3.3-13, "MOORE RANCH PROJECT DRILL HOLE MAP"

WITHIN THIS PACKAGE... OR, BY SEARCHING USING THE DOCUMENT/REPORT DRAWING NO. FIGURE 3.3-13

D-01

ADDENDUM 3.3-B

SOIL MAPPING UNIT DESCRIPTIONS and SOILS MAP

110: Bidman loam, loamy substratum, 0 to 6 percent slopes[1]

The Bidman loam, loamy substratum, map unit consists of very deep, well-drained soils that developed from alluvium derived from calcareous shale. It occurs on alluvial fans and fan remnants at elevations between 4,100 and 5,200 feet.

The average annual precipitation ranges from 10 to 14 inches. The average annual air temperature is approximately 45 to 49 degrees F., and the average frost-free season is approximately 105 to 130 days.

This map unit is approximately 80 percent Bidman loam, loamy substratum. Within this map unit the following additional components are found: Bidman loam, Forkwood, Felix ponded, and Ulm. Inclusions comprise approximately 20 percent of the map unit.

Permeability within the Bidman loam, loamy substratum soil is slow. The available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is slow and the hazard of water erosion is slight. The hazard of wind erosion is moderate.

Productivity and Reclamation Potential

There are six plant species that are common to this map unit. They are as follows: Needleandthread, Western wheatgrass, Blue grama, Green needlegrass, and Cusick's bluegrass. Big sagebrush is the only shrub specie found within this unit.

In a favorable year (above average moisture) the production is approximately 1,500 lbs/acre. In a normal year that production is 1,200 lbs/acre. Also in an unfavorable (drought) year the production is approximately 700 lbs/acre.

There are three areas that are considered for reclamation: topsoil, roadfill, and reclamation material. This unit is a poor source for topsoil due to the high clay content of the soil. It is a poor source for roadfill due to the low strength and the shrink-swell capacity. As for reclamation material it is a poor choice for the following reasons: high clay content, low organic matter content, and the water erosion potential.

[1]Map unit description based on 2002 South Campbell County NRCS information.

144: Forkwood loam, 0 to 6 percent slopes[1]

The Forkwood loam map unit consists of very deep, well-drained soils that developed from alluvium derived from sandstone and shale. It occurs on alluvial fans and fan remnants at elevations between 4,100 and 5,200 feet.

The average annual precipitation ranges from 10 to 14 inches. The average annual air temperature is approximately 43 to 51 degrees F., and the average frost-free season is approximately 105 to 130 days.

This map unit is approximately 80 percent Forkwood loam. Within this map unit the following additional components are found: Cambria, Ulm, and Wyotite. Inclusions comprise approximately 20 percent of the map unit.

Permeability within the Forkwood loam soil is moderate. The available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is slow and the hazard of water erosion is slight. The hazard of wind erosion is moderate.

Productivity and Reclamation Potential

There are six plant species that are common to this map unit. They are as follows: Needleandthread, Western wheatgrass, Blue grama, Green Needlegrass, and Cusick's bluegrass. Big sagebrush is the only shrub found within this unit.

In a favorable year (above average moisture) the production is approximately 1,500 lbs/acre. In a normal year the production is 1,200 lbs/acre. Also in an unfavorable (drought) year the production is approximately 700 lbs/acre.

There are three areas that are considered for reclamation: topsoil, roadfill, and reclamation material. This unit is a fair source for topsoil with the high clay content being the limiting factor. It is a fair choice for roadfill with the low strength being the limiting factor. As for reclamation material it is a fair choice for the following reasons: low organic matter content, the high clay content, and water erosion.

[1]Map unit description based on 2002 South Campbell County NRCS information.

156: Hiland fine sandy loam, 0 to 6 percent slopes[1]

The Hiland fine sandy loam map unit consists of very deep, well-drained soils that developed from alluvium and eolian deposits derived from sandstone and shale. It occurs on alluvial fans and fan remnants at elevations between 4,100 and 5,300 feet.

The average annual precipitation ranges from 10 to 14 inches. The average annual air temperature is approximately 43 to 51 degrees F., and the average frost-free season is approximately 105 to 130 days.

This map unit is approximately 85 percent Hiland fine sandy loam. Within this map unit the following additional components are found: Forkwood, Maysdorf, Moskee, and Vonalee. Inclusions comprise approximately 15 percent of the map unit.

Permeability within the Hiland fine sandy loam soil is moderate. The available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is slow and the hazard of water erosion is slight. The hazard of wind erosion is severe.

Production and Reclamation Potential

There are eight plant species that are common to this map unit. They are as follows: Needleandthread, Prairie sandreed, Indian ricegrass, Little bluestem, Western wheatgrass, Blue grama, and Threadleaf sedge. Silver sagebrush is the only shrub specie found within this unit.

In a favorable year (above average moisture) the production is approximately 1,600 lbs/acre. In a normal year that production is 1,300 lbs/acre. Also in an unfavorable (drought) year the production is approximately 750 lbs/acre.

There are three areas that are considered for reclamation: topsoil, roadfill, and reclamation material. This unit is a good source for topsoil, no limitations are found. It is a good source for roadfill as no limitations are found. As for reclamation material it is a fair choice for the following reason, low organic matter content.

[1]Map unit description based on 2002 South Campbell County NRCS information.

226: Ulm loam, 0 to 6 percent slopes[1]

The Ulm loam map unit consists of very deep, well-drained soils that developed from alluvium derived from calcareous shale. It occurs on alluvial fans and fan remnants at elevations between 4,100 and 5,000 feet.

The average annual precipitation ranges from 10 to 14 inches. The average annual air temperature is approximately 46 to 51 degrees F., and the average frost-free season is approximately 105 to 130 days.

It map unit is approximately 85 percent Ulm loam. Within this map unit the following additional components are found: Bidman, and Forkwood. Inclusions comprise approximately 15 percent of the map unit.

Permeability within the Ulm loam soil is slow. The available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is moderate, and the hazard of water erosion is slight. The hazard of wind erosion is moderate.

Productivity and Reclamation Potential

There are six plant species that are common to this map unit. They are as follows: Needleandthread, Western wheatgrass, Blue grama, Green needlegrass, and Cusick's bluegrass. Big sagebrush is the only shrub specie found within this unit.

In a favorable year (above average moisture) the production is approximately 1,500 lbs/acre. In a normal year the production is 1,200 lbs/acre. Also in an unfavorable (drought) year the production is approximately 700 lbs/acre.

There are three areas that are considered for reclamation: topsoil, roadfill, and reclamation material. This unit is a fair source for topsoil with high clay content being the limiting factor. It is a poor source for roadfill due to the low strength and the shrink-swell capacity. As for reclamation material it is a fair choice for the following reasons: high clay content, low organic matter content, and the water erosion potential.

[1]Map unit description based on 2002 South Campbell County NRCS information.

227: Ulm clay loam, 0 to 6 percent slopes[1]

The Ulm clay loam map unit consists of very deep, well-drained soils that developed from alluvium derived from calcareous shale. It occurs on alluvial fans and fan remnants at elevations between 4,100 and 5,000 feet.

The average annual precipitation ranges from 10 to 14 inches. The average annual air temperature is approximately 46 to 51 degrees F., and the average frost-free season is approximately 105 to 130 days.

It map unit is approximately 85 percent Ulm clay loam. Within this map unit the following additional components are found: Bidman, and Forkwood. Inclusions comprise approximately 15 percent of the map unit.

Permeability within the Ulm clay loam soil is slow. The available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is moderate, and the hazard of water erosion is slight. The hazard of wind erosion is moderate.

Productivity and Reclamation Potential

There are five plant species that are common to this map unit. They are as follows: Green needlegrass, Western wheatgrass, Blue grama, and Skyline bluegrass. Big sagebrush is the only shrub specie found within this unit.

In a favorable year (above average moisture) the production is approximately 1,400 lbs/acre. In a normal year the production is 1,000 lbs/acre. Also in an unfavorable (drought) year the production is approximately 600 lbs/acre.

There are three areas that are considered for reclamation: topsoil, roadfill and reclamation material. This unit is a poor choice for topsoil due to the high clay content of the soil. It is a poor source for roadfill due to the low strength and the shrink-swell capacity. As for reclamation material it is a poor choice for the following reasons: high clay content, low organic matter content, and water erosion potential.

[1]Map unit description based on 2002 South Campbell County NRCS information.

235: Vonalee fine sandy loam, 0 to 10 percent slopes[1]

The Vonalee fine sandy loam map unit consists of very deep, well-drained soils that developed from alluvium and eolian deposists derived from calcareous sandstone. It occurs on alluvial fans and fan remnants at elevations between 4,100 and 5,200 feet.

The average annual precipitation ranges from 10 to 14 inches. The average annual air temperature is approximately 44 to 49 degrees F., and the average frost-free season is approximately 105 to 130 days.

This map unit is approximately 80 percent Vonalee fine sandy loam. Within this map unit the following additional components are found: Hiland, Keeline, Terro, and areas with 10 to 15 percent slopes. Inclusions comprise approximately 20 percent of the map unit.

Permeability within the Vonalee fine sandy loam soil is moderately rapid. The Available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is low and the hazard of water erosion is moderate. The hazard of wind erosion is severe.

Productivity and Reclamation Potential

There are eight plant species that are common to this map unit. They are as follows: Needleandthread, Prairie sandreed, Indian ricegrass, Little bluestem, Western wheatgrass, Blue grama, and Threadleaf sedge. Silver sagebrush is the only shrub specie found within this unit.

In a favorable year (above average moisture) the production is approximately 1,600 lbs/acre. In a normal year the production is 1,300 lbs/acre. Also in an unfavorable (drought) year the production is approximately 750 lbs/acre.

There are three areas that are considered for reclamation: topsoil, roadfill, and reclamation material. This unit is a good source for topsoil as no limitations are found. It is a good source for roadfill as no limitations are found. As for reclamation material it is a fair choice for the following reason, low organic matter content.

[1]Map unit description based on 2002 South Campbell County NRCS information.

111-1: Bidman loam, 0 to 6 percent slopes[1]

The Bidman loam, map unit consists of very deep, well-drained soils that developed from alluvium derived from calcareous shale. It occurs on alluvial fans and fan remnants at elevations between 4,100 and 5,200 feet.

The average annual precipitation ranges from 10 to 14 inches. The average annual air temperature is approximately 45 to 49 degrees F., and the average frost-free season is approximately 105 to 130 days.

This map unit is approximately 80 percent Bidman loam. Within this map unit the following additional components are found: Cushman, Forkwood, Felix ponded, Parmleed, and Ulm. Inclusions comprise approximately 20 percent of the map unit.

Permeability within the Bidman loam, soil is slow. The available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is slow and the hazard of water erosion is slight. The hazard of wind erosion is moderate.

Productivity and Reclamation Potential

There are six plant species that are common to this map unit. They are as follows: Needleandthread, Western wheatgrass, Blue grama, Green Needlegrass, and Cusick's bluegrass. Big sagebrush is the only shrub specie found within this unit.

In a favorable year (above average moisture) the production is approximately 1,500 lbs/acre. In a normal year the production is 1,200 lbs/acre. Also in an unfavorable (drought) year the production is approximately 700 lbs/acre.

There are three areas that are considered for reclamation: topsoil, roadfill, and reclamation material. This unit is a poor source for topsoil due to the high clay content of the soil. It is a poor source for roadfill due to the low strength and the shrink-swell capacity. As for reclamation material it is a poor choice for the following reasons: high clay content, low organic matter content, and the water erosion potential.

[1]Map unit description based on 2002 South Campbell County NRCS information.

111-2: Parmleed loam, 0 to 6 percent slopes[1]

The Parmleed loam map unit consists of moderately deep, well-drained soils that developed from alluvium over residuum weathered from calcareous shale. It occurs on hills and ridges at elevations between 4,100 and 5,200 feet.

The average annual precipitation ranges from 10 to 14 inches. The average annual air temperature is approximately 45 to 48 degrees F., and the average frost-free season is approximately 105 to 130 days.

This map unit is approximately 80 percent Parmleed loam. Within this map unit the following additional components are found: Bidman, Cushman, Forkwood, Felix ponded, and Ulm. Inclusions comprise approximately 20 percent of the map unit.

Permeability within the Parmleed loam soil is slow. The available water capacity is low. Effective rooting depth is 20 to 40 inches. Surface runoff is slow to moderate and the hazard of water erosion is slight. The hazard of wind erosion is moderate.

Productivity and Reclamation Potential

There are six plant species that are common to this map unit. They are as follows: Needleandthread, Western wheatgrass, Blue grama, Green needlegrass, and Cusick's bluegrass. Big sagebrush is the only shrub specie found within this unit.

In a favorable year (above average moisture) the production is approximately 1,500 lbs/acre. In a normal year that production is 1,200 pounds. Also in an unfavorable (drought) year the production is approximately 700 lbs/acre.

There are three areas that are considered for reclamation: topsoil, roadfill, and reclamation material. This unit is a poor source for topsoil due to the high clay content of the soil. It is a poor source for roadfill due to the low strength and the shrink-swell capacity. As for reclamation material it is a poor choice for the following reasons: high clay content, depth to bedrock, droughtiness, low organic matter content, and the water erosion potential.

[1]Map unit description based on 2002 South Campbell County NRCS information.

112-1: Bidman loam, 6 to 15 percent slopes[1]

The Bidman loam, map unit consists of very deep, well-drained soils that developed from alluvium derived from calcareous shale. It occurs on hills and ridges at elevations between 4,100 and 5,200 feet.

The average annual precipitation ranges from 10 to 14 inches. The average annual air temperature is approximately 45 to 49 degrees F., and the average frost-free season is approximately 105 to 130 days.

This map unit is approximately 80 percent Bidman loam. Within this map unit the following additional components are found: Cushman, Forkwood, Parmleed, and Worfka. Inclusions comprise approximately 20 percent of the map unit.

Permeability within the Bidman loam, soil is slow. The available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is slow and the hazard of water erosion is slight. The hazard of wind erosion is moderate.

Productivity and Reclamation Potential

There are six plant species that are common to this map unit. They are as follows: Needleandthread, Western wheatgrass, Blue grama, Green needlegrass, and Cusick's bluegrass. Big sagebrush is the only shrub specie found within this unit.

In a favorable year (above average moisture) the production is approximately 1,500 lbs/acre. In a normal year that production is 1,200 lbs/acre. Also in an unfavorable (drought) year the production is approximately 700 lbs/acre.

There are three areas that are considered for reclamation: topsoil, roadfill, and reclamation material. This unit is a poor source for topsoil due to the high clay content of the soil. It is a poor source for roadfill due to the low strength and the shrink-swell capacity, As for reclamation material it is a poor choice for the following reasons: high clay content and water erosion potential.

[1]Map unit description based on 2002 South Campbell County NRCS information.

112-2: Parmleed loam, 6 to 15 percent slopes[1]

The Parmleed loam map unit consists of moderately deep, well-drained soils that developed from alluvium over residuum weathered from calcareous shale. It occurs on hills and ridges at elevations between 4,100 and 5,200 feet.

The average annual precipitation ranges from 10 to 14 inches. The average annual air temperature is approximately 45 to 48 degrees F., and the average frost-free season is approximately 105 to 130 days.

This map unit is approximately 80 percent Parmleed loam. Within this map unit the following additional components are found: Bidman, Cushman, Forkwood, and Worfka. Inclusions comprise approximately 20 percent of the map unit.

Permeability within the Parmleed loam soil is slow. The available water capacity is low. Effective rooting depth is 20 to 40 inches. Surface runoff is slow to moderate and the hazard of water erosion is slight. The hazard of wind erosion is moderate.

Productivity and Reclamation Potential

There are six plant species that are common to this map unit. They are as follows: Needleandthread, Western wheatgrass, Blue grama, Green needlegrass, and Cusick's bluegrass. Big sagebrush is the only shrub specie found within this unit.

In a favorable year (above average moisture) the production is approximately 1,500 lbs/acre. In a normal year that production is 1,200 lbs/acre. Also in an unfavorable (drought) year the production is approximately 700 lbs/acre.

There are three areas that are considered for reclamation: topsoil, roadfill, and reclamation material. This unit is a poor source for topsoil due to the high clay content, slope and depth to bedrock. It is a poor source for roadfill due to the low strength, depth to bedrock, and the shrink-swell capacity. As for reclamation material it is a poor choice for the following reasons: high clay content, droughtiness, depth to bedrock, low organic matter content, and the water erosion potential.

[1]Map unit description based on 2002 South Campbell County NRCS information.

116-1: Cambria loam, 0 to 6 percent slopes[1]

The Cambria loam map unit consists of very deep, well-drained soils that developed from alluvium derived from sandstone and shale. It occurs on alluvial fans and fan remnants are elevations between 4,100 and 5,200 feet.

The average annual precipitation ranges from 10 to 14 inches. The average annual air temperature is approximately 43 to 51 degrees F., and the average frost-free season is approximately 105 to 130 days.

This map unit is approximately 80 percent Cambria loam. Within this map unit the following additional components are found: Cushman, Forkwood, Kishona, poorly drained soils, Ulm and Zigweid. Inclusions comprise approximately 20 percent of the map unit.

Permeability within the Cambria loam soil is moderate. The available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is slow and the hazard of water erosion is slight. The hazard of wind erosion is moderate.

Productivity and Reclamation Potential

There are six plant species that are common to this map unit. They are as follows: Needleandthread, Western wheatgrass, Blue grama, Green Needlegrass, and Cusick's bluegrass. Big sagebrush is the only shrub specie found within this unit.

In a favorable year (above average moisture) the production is approximately 1,500 lbs/acre. In a normal year that production is 1,200 lbs/acre. Also in an unfavorable (drought) year the production is approximately 700 lbs/acre.

There are three areas that are considered for reclamation: topsoil, roadfill, and reclamation material. This unit is a good source for topsoil as no limitations are found. It is a fair source for roadfill due to the low strength and the shrink-swell capacity. As for reclamation material it is a fair choice for the following reasons: low organic matter content and the water erosion potential.

[1]Map unit description based on 2002 South Campbell County NRCS information.

116-2: Kishona loam, 0 to 6 percent slopes[1]

The Kishona loam map unit consists of very deep well-drained soils that developed from alluvium derived from sandstone and shale. It occurs on alluvial fans and fan remnants at elevations between 4,100 and 5,200 feet.

The average annual precipitation ranges from 10 to 14 inches. The average annual air temperature is approximately 43 to 51 degrees F., and the average frost-free season is approximately 105 to 130 days.

This map unit is approximately 80 percent Kishona loam. Within this map unit the following additional components are found: Cambria, Cushman, Forkwood, poorly drained soils, Ulm, and Zigweid. Inclusions comprise approximately 20 percent of the map unit.

Permeability within the Kishona loam soil is moderate. The available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is slow and the hazard of water erosion is slight. The hazard of wind erosion is moderate.

Productivity and Reclamation Potential

There are six plant species that are common to this map unit. They are as follows: Needleandthread, Western wheatgrass, Blue grama, Green Needlegrass, and Cusick's bluegrass. Big sagebrush is the only shrub specie found within this unit.

In a favorable year (above average moisture) the production is approximately 1,500 lbs/acre. In a normal year that production is 1,200 lbs/acre. Also in an unfavorable (drought) year the production is approximately 700 lbs/acre.

There are three areas that are considered for reclamation: topsoil, roadfill, and reclamation material. This unit is a good source for topsoil as no limitations are found. It is a poor source for roadfill due to the low strength and the shrink-swell capacity. As for reclamation material it is a fair choice for the following reasons: low organic matter content and the water erosion potential.

[1]Map unit description based on 2002 South Campbell County NRCS information.

116-3: Zigweid loam, 0 to 6 percent slopes[1]

The Zigweid loam map unit consists of very deep, well-drained soils that developed from alluvium derived from sandstone and shale. It occurs on alluvial fans and fan remnants at elevations between 4,100 and 5,200 feet.

The average annual precipitation ranges from 10 to 14 inches. The average annual air temperature is approximately 43 to 51 degrees F., and the average frost-free season is approximately 105 to 130 days.

This map unit is approximately 80 percent Zigweid loam. Within this map unit the following additional components are found: Cambria, Cushman, Forkwood, Kishona, poorly drained soils, and Ulm. Inclusions comprise approximately 20 percent of the map unit.

Permeability within the Zigweid loam soil is moderate. The available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is slow and the hazard of water erosion is slight. The hazard of wind erosion is moderate.

Productivity and Reclamation Potential

There are six plant species that are common to this map unit. They are as follows: Needleandthread, Western wheatgrass, Blue grama, Green Needlegrass, and Cusick's bluegrass. Big sagebrush is the only shrub specie found within this unit.

In a favorable year (above average moisture) the production is approximately 1,500 lbs/acre. In a normal year that production is 1,200 lbs/acre. Also in an unfavorable (drought) year the production is approximately 700 lbs/acre.

There are three areas that are considered for reclamation: topsoil, roadfill, and reclamation material. This unit is a good source for topsoil as no limitations are found. It is a poor source for roadfill due to the low strength and the shrink-swell capacity. As for reclamation material it is a fair choice for the following reasons: low organic matter content and the water erosion potential.

[1]Map unit description based on 2002 South Campbell County NRCS information.

117-1: Cambria loam, 6 to 15 percent slopes[1]

The Cambria loam map unit consists of very deep, well-drained soils that developed from alluvium derived from sandstone and shale. It occurs on hills and ridges at elevations between 4,100 and 5,200 feet.

The average annual precipitation ranges from 10 to 14 inches. The average annual air temperature is approximately 43 to 51 degrees F., and the average frost-free season is approximately 105 to 130 days.

This map unit is approximately 80 percent Cambria loam. Within this map unit the following additional components are found: Cushman, Forkwood, Kishona, Theedle and Zigweid. Inclusions comprise approximately 20 percent of the map unit.

Permeability within the Cambria loam soil is moderate. The available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is slow and the hazard of water erosion is slight. The hazard of wind erosion is moderate.

Productivity and Reclamation Potential

There are six plant species that are common to this map unit. They are as follows: Needleandthread, Western wheatgrass, Blue grama, Green Needlegrass, and Cusick's bluegrass. Big sagebrush is the only shrub specie found within this unit.

In a favorable year (above average moisture) the production is approximately 1,500 lbs/acre. In a normal year that production is 1,200 lbs/acre. Also in an unfavorable (drought) year the production is approximately 700 lbs/acre.

There are three areas that are considered for reclamation: topsoil, roadfill, and reclamation material. This unit is a fair source for topsoil with slope being the limiting factor. It is a fair source for roadfill due to the low strength and the shrink-swell capacity. As for reclamation material it is a fair choice for the following reasons: low organic matter content and the water erosion potential.

[1]Map unit description based on 2002 South Campbell County NRCS information.

117-2: Kishona loam, 6 to 20 percent slopes

The Kishona loam map unit consists of very deep well-drained soils that developed from alluvium derived from sandstone and shale. It occurs on stream terraces at elevations between 4,100 and 5,000 feet.

The average annual precipitation ranges from 10 to 14 inches. The average annual air temperature is approximately 43 to 51 degrees F., and the average frost-free season is approximately 105 to 130 days.

This map unit is approximately 80 percent Kishona loam. Within this map unit the following additional components are found: Cambria, Cushman, Forkwood, Theedle, and Zigweid. Inclusions comprise approximately 20 percent of the map unit.

Permeability within the Kishona association soil is moderate. The available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is moderate and the hazard of water erosion is severe. The hazard of wind erosion is moderate.

Productivity and Reclamation Potential

There are six plant species that are common to this map unit. They are as follows: Needleandthread, Western wheatgrass, Blue grama, Green needlegrass, and Cusick's bluegrass. Big sagebrush is the only shrub specie found within this unit.

In a favorable year (above average moisture) the production is approximately 1,500 lbs/acre. In a normal year that production is 1,200 lbs/acre. Also in an unfavorable (drought) year the production is approximately 700 lbs/acre.

There are three areas that are considered for reclamation: topsoil, roadfill, and reclamation material. This unit is a fair source for topsoil with slope being the limiting factor. It is a poor source for roadfill due to the low strength and the shrink-swell capacity. As for reclamation material it is a fair choice for the following reasons: low organic matter content, and the water erosion potential.

[1]Map unit description based on 2002 South Campbell County NRCS information.

122-1: Cushman loam, 6 to 15 percent slopes[1]

The Cushman loam map unit consists of moderately deep, well-drained soils that developed from alluvium over residuum weathered from sandstone and shale. It occurs on hills and ridges at elevations between 4,100 and 5,200 feet.

The average annual precipitation ranges from 10 to 14 inches. The average annual air temperature is approximately 43to 51egrees F., and the average frost-free season is approximately 105 to 130 days.

This map unit is approximately 80 percent Cushman loam. Within this map unit the following additional components are found: Bowbac, Cambria, Forkwood, Worf, and Zigweid. Inclusions comprise approximately 20 percent of the map unit.

Permeability within the Cushman loam soil is moderate. The available water capacity is moderate. Effective rooting depth is 20 to 40 inches. Surface runoff is moderate and the hazard of water erosion is severe. The hazard of wind erosion is moderate.

Productivity and Reclamation Potential

There are six plant species that are common to this map unit. They are as follows: Needleandthread, Western wheatgrass, Blue grama, Green Needlegrass, and Cusick's bluegrass. Big sagebrush is the only shrub specie found within this unit.

In a favorable year (above average moisture) the production is approximately 1,500 lbs/acre. In a normal year that production is 1,200 lbs/acre. Also in an unfavorable (drought) year the production is approximately 700 lbs/acre.

There are three areas that are considered for reclamation: topsoil, roadfill, and reclamation material. This unit is a fair source for topsoil with slope and depth to bedrock being the limiting factors. It is a poor source for roadfill due to the low strength, depth to bedrock, and the shrink-swell capacity. As for reclamation material it is a fair choice for the following reasons: depth to bedrock, droughtiness, low organic matter content, and the water erosion potential.

[1]Map unit description based on 2002 South Campbell County NRCS information.

124-1: Cushman loam, 6 to 15 percent slopes[1]

The Cushman loam map unit consists of moderately deep, well-drained soils that developed from alluvium over residuum weathered from sandstone and shale. It occurs on hills and ridges at elevations between 4,100 and 5,400 feet.

The average annual precipitation ranges from 10 to 14 inches. The average annual air temperature is approximately 43to 51egrees F., and the average frost-free season is approximately 105 to 130 days.

This map unit is approximately 80 percent Cushman loam. Within this map unit the following additional components are found: Areas with 3 to 6 percent slopes, Cambria, Renohill, Samday, Shingle, Theedle, and Worf. Inclusions comprise approximately 20 percent of the map unit.

Permeability within the Cushman loam soil is moderate. The available water capacity is moderate. Effective rooting depth is 20 to 40 inches. Surface runoff is moderate and the hazard of water erosion is severe. The hazard of wind erosion is moderate.

Productivity and Reclamation Potential

There are six plant species that are common to this map unit. They are as follows: Needleandthread, Western wheatgrass, Blue grama, Green Needlegrass, and Cusick's bluegrass. Big sagebrush is the only shrub specie found within this unit.

In a favorable year (above average moisture) the production is approximately 1,500 lbs/acre. In a normal year that production is 1,200 lbs/acre. Also in an unfavorable (drought) year the production is approximately 700 lbs/acre.

There are three areas that are considered for reclamation: topsoil, roadfill, and reclamation material. This unit is a fair source for topsoil with depth to bedrock and slope being the limiting factors. It is a poor source for roadfill due to the low strength, depth to bedrock, and the shrink-swell capacity. As for reclamation material it is a fair choice for the following reasons: depth to bedrock, droughtiness, low organic matter content, and the water erosion potential.

[1]Map unit description based on 2002 South Campbell County NRCS information.

124-2: Shingle loam, 3 to 30 percent slopes[1]

The Shingle loam map unit consists of shallow, well-drained soils that developed from residuum weathered from sandstone and shale. It occurs on hills and ridges at elevations between 4,100 and 5,400 feet

The average annual precipitation ranges from 10 to 14 inches. The average annual air temperature is approximately 43 to 51 degrees F., and the average frost-free season is approximately 105 to 130 days.

This map unit is approximately 80 percent Shingle loam. Within this map unit the following additional components are found: Areas with 3 to 6 percent slopes, Cambria, Cushman, Renohill, Samday, Theedle, and Worf. Inclusions comprise approximately 20 percent of the map unit.

Permeability within the Shingle loam soil is moderate. The available water capacity is very low. Effective rooting depth is 10 to 20 inches. Surface runoff is very high and the hazard of water erosion is severe. The hazard of wind erosion is moderate.

Productivity and Reclamation Potential

There are eight plant species that are common to this map unit. They are as follows: Bluebunch wheatgrass, Western wheatgrass, Blue grama, Little bluestem, Needleandthread, Threadleaf sedge, and Green needlegrass. Big sagebrush is the only shrub specie found within this unit.

In a favorable year (above average moisture) the production is approximately 1,200 lbs/acre. In a normal year that production is 900 lbs/acre. Also in an unfavorable (drought) year the production is approximately 450 lbs/acre.

There are three areas that are considered for reclamation: topsoil, roadfill, and reclamation material. This unit is a fair source for topsoil with depth to bedrock and slope being the limiting factors. It is a poor source for roadfill due to the low strength, depth to bedrock, and the shrink-swell capacity. As for reclamation material it is a poor choice for the following reasons: droughtiness, depth to bedrock, low organic matter content, and the water erosion potential.

[1]Map unit description based on 2002 South Campbell County NRCS information.

127-2: Theedle loam, 0 to 30 percent slopes[1]

The Theedle map unit consists of moderately deep, well-drained soils that developed from alluvium over residuum weathered from sandstone and shale. If occurs on hills and ridges at elevations between 4,100 and 5,200 feet.

The average annual precipitation ranges from 10 to 14 inches. The average annual air temperature is approximately 45 to 51 degrees F., and the average frost-free season is approximately 105 to 130 days.

This map unit is approximately 80 percent Theedle loam. Within this map unit the following additional components are found: Cambria, Cushman, Kishona, and Shingle. Inclusions comprise approximately 20 percent of the map unit.

Permeability within the Theedle loam soil is moderate. The available water capacity is low. Effective rooting depth is 20 to 40 inches. Surface runoff is high and the hazard of water erosion is severe. The hazard of wind erosion is moderate.

Productivity and Reclamation Potential

There are eight plant species that are common to this map unit. They are as follows: Needleandthread, Prairie sandreed, Indian ricegrass, Little bluestem, Western wheatgrass, Blue grama, and Threadleaf sedge. Silver sagebrush is the only shrub specie found within this unit.

In a favorable year (above average moisture) the production is approximately 1,500 lbs/acre. In a normal year that production is 1,200 lbs/acre. Also in an unfavorable (drought) year the production is approximately 700 lbs/acre.

There are three areas that are considered for reclamation: topsoil, roadfill, and reclamation material. This unit is a fair source for topsoil with depth to bedrock and slope being the limiting factors. It is a poor source for roadfill due to the low strength, depth to bedrock, and the shrink-swell capacity. As for reclamation material it is a fair choice for the following reasons: depth to bedrock, droughtiness, low organic matter content, and the water erosion potential.

[1]Map unit description based on 2002 South Campbell County NRCS information.

140-1: Embry sandy loam, 3 to 20 percent slopes[1]

The Embry sandy loam map unit consists of very deep, well-drained soils that developed from alluvium and eolian deposits derived from sandstone. It occurs on hills and ridges at elevations between 4,200 and 5,000 feet.

The average annual precipitation ranges from 10 to 14 inches. The average annual air temperature is approximately 45 to 50 degrees F., and the average frost-free season is approximately 105 to 130 days.

This map unit is approximately 80 percent Embry sandy loam. Within this map unit the following additional components are found: Julesburg, Shingle, Taluce, and Turnercrest. Inclusions comprise approximately 20 percent of the map unit.

Permeability within the Embry sandy loam soil is moderately rapid. The available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is slow and the hazard of water erosion is moderate. The hazard of wind erosion is severe.

Productivity and Reclamation Potential

There are eight plant species that are common to this map unit. They are as follows: Needleandthread, Prairie sandreed, Indian ricegrass, Little bluestem, Western wheatgrass, Blue grama, and Threadleaf sedge. Silver sagebrush is the only shrub specie found within this unit.

In a favorable year (above average moisture) the production is approximately 1,600 lbs/acre. In a normal year that production is 1,300 lbs/acre. Also in an unfavorable (drought) year the production is approximately 750 lbs/acre.

There are three areas that are considered for reclamation: topsoil, roadfill, and reclamation material. This unit is a fair source for topsoil with slope being the limiting factor. It is a good source for roadfill as no limitations are found. As for reclamation material it is a fair choice for the following reasons, low organic matter content.

[1]Map unit description based on 2002 South Campbell County NRCS information.

146-2: Cushman loam, 0 to 6 percent slopes[1]

The Cushman loam map unit consists of moderately deep, well-drained soils that developed from alluvium over residuum weathered from sandstone and shale. It occurs on hills and ridges at elevations between 4,100 and 5,200 feet

The average annual precipitation ranges from 10 to 14 inches. The average annual air temperature is approximately 43 to 51 degrees F., and the average frost-free season is approximately 105 to 130 days.

This map unit is approximately 80 percent Cushman loam. Within this map unit the following additional components are found: Bowbac, Cambria, Forkwood, frequently ponded loamy soils, frequently ponded clayey soils, Hiland, and Theedle. Inclusions comprise approximately 20 percent of the map unit.

Permeability within the Cushman loam soil is moderate. The available water capacity is moderate. Effective rooting depth is 20 to 40 inches. Surface runoff is moderate and the hazard of water erosion is severe. The hazard of wind erosion is moderate.

Productivity and Reclamation Potential

There are six plant species that are common to this map unit. They are as follows: Needleandthread, Western wheatgrass, Blue grama, Green Needlegrass, and Cusick's bluegrass. Big sagebrush is the only shrub specie found within this unit.

In a favorable year (above average moisture) the production is approximately 1,500 lbs/acre. In a normal year that production is 1,200 lbs/acre. Also in an unfavorable (drought) year the production is approximately 700 lbs/acre.

There are three areas that are considered for reclamation: topsoil, roadfill, and reclamation material. This unit is a fair source for topsoil with depth to bedrock being the limiting factor. It is a poor source for roadfill due to the low strength, depth to bedrock, and the shrink-swell capacity. As for reclamation material it is a fair choice for the following reasons: droughtiness, depth to bedrock, low organic matter content, and the water erosion potential.

[1]Map unit description based on 2002 South Campbell County NRCS information.

147-1: Forkwood loam, 6 to 15 percent slopes[1]

The Forkwood loam map unit consists of very deep. Well-drained soils that developed from alluvium derived from sandstone and shale. It occurs on hills and ridges at elevations between 4,100 and 5,200 feet.

The average annual precipitation ranges from 10 to 14 inches. The average annual air temperature is approximately 43 to 51 degrees F., and the average frost-free season is approximately 105 to 130 days.

This map unit is approximately 80 percent Forkwood loam. Within this map unit the following additional components are found: Cambria, Cushman, Theedle, Ulm, and Zigweid. Inclusions comprise approximately 20 percent of the map unit.

Permeability within the Forkwood loam map unit is moderate. The available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is slow, and the hazard of water erosion is slight. The hazard of wind erosion is moderate.

Productivity and Reclamation Potential

There are six plant species that are common to this map unit. They are as follows: Needleandthread, Western wheatgrass, Blue grama, Green needlegrass, and Cusick's bluegrass. Big sagebrush is the only shrub specie found within this unit.

In a favorable year (above average moisture) the production is approximately 1,500 lbs/acre. In a normal year that production is 1,200 lbs/acre. Also in an unfavorable (drought) year the production is approximately 700 lbs/acre.

There are three areas that are considered for reclamation: topsoil, roadfill, and reclamation material. This unit is a fair source for topsoil with the high clay content and slope being the limiting factors. It is a fair source for roadfill due to the low strength. As for reclamation material it is a fair choice for the following reasons: high clay content, low organic matter content, and the water erosion potential.

[1]Map unit description based on 2002 South Campbell County NRCS information.

153-1: Haverdad clay loam, 0 to 6 percent slopes[1]

The Haverdad association map unit consists of very deep, well-drained soils that developed from alluvium derived from sandstone and shale. If occurs on flood plains and stream terraces at elevations between 4,100 and 5,000 feet.

The average annual precipitation ranges from 10 to 14 inches. The average annual air temperature is approximately 43 to 52 degrees F., and the average frost-free season is approximately 105 to 130 days.

This map unit is approximately 80 percent Haverdad association. Within this map unit the following additional components are found: Boruff, Clarkelen, Keeline and Kishona. Inclusions comprise approximately 20 percent of the map unit.

Permeability within the Haverdad association soil is moderate. The available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is slow and the hazard of water erosion is slight. The hazard of wind erosion is moderate.

Note: This soil is subject to rare to occasional flooding for very brief periods during prolonged, high intensity storms from April through July.

Productivity and Reclamation Potential

There are seven plant species that are common to this map unit. They are as follows: Green needlegrass, Needleandthread, Slender wheatgrass, Western wheatgrass, and Sandberg bluegrass. Snowberry is the only shrub specie found within this unit. Cottonwood is the only tree specie found within this unit.

In a favorable year (above average moisture) the production is approximately 3,000 lbs/acre. In a normal year that production is 2,300 lbs/acre. Also in an unfavorable (drought) year the production is approximately 1,600 lbs/acre.

There are three areas that are considered for reclamation: topsoil, roadfill, and reclamation material. This unit is a good source for topsoil as no limitations are found. It is a poor source for roadfill due to the low strength and the shrink-swell capacity. As for reclamation material it is a fair choice for the following reasons: low organic matter content, and the water erosion potential.

[1]Map unit description based on 2002 South Campbell County NRCS information.

153-2: Kishona association, 0 to 6 percent slopes[1]

The Kishona association map unit consists of very deep well-drained soils that developed from alluvium derived from sandstone and shale. It occurs on stream terraces at elevations between 4,100 and 5,000 feet.

The average annual precipitation ranges from 10 to 14 inches. The average annual air temperature is approximately 43 to 51 degrees F., and the average frost-free season is approximately 105 to 130 days.

This map unit is approximately 80 percent Kishona association. Within this map unit the following additional components are found: Boruff, Clarkelen, Haverdad, and Keeline. Inclusions comprise approximately 20 percent of the map unit.

Permeability within the Kishona association soil is moderate. The available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is slow and the hazard of water erosion is slight. The hazard of wind erosion is moderate.

Productivity and Reclamation Potential

There are six plant species that are common to this map unit. They are as follows: Needleandthread, Western wheatgrass, Blue grama, Green needlegrass, and Cusick's bluegrass. Big sagebrush is the only shrub specie found within this unit.

In a favorable year (above average moisture) the production is approximately 1,500 lbs/acre. In a normal year that production is 1,200 lbs/acre. Also in an unfavorable (drought) year the production is approximately 700 lbs/acre.

There are three areas that are considered for reclamation: topsoil, roadfill, and reclamation material. This unit is a good source for topsoil as no limitations are found. It is a poor source for roadfill due to the low strength and the shrink-swell capacity. As for reclamation material it is a fair choice for the following reasons: low organic matter content, and the water erosion potential.

[1]Map unit description based on 2002 South Campbell County NRCS information.

157-2: Bowbac fine sandy loam, 0 to 6 percent slopes[1]

The Bowbac fine sandy loam map unit consists of moderately deep, well-drained soils that developed from alluvium and eolian deposits over residuum weathered from calcareous sandstone. It occurs on hills and ridges at elevations between 4,100 and 5,300 feet.

The average annual precipitation ranges from 10 to 14 inches. The average annual air temperature is approximately 43 to 51 degrees F., and the average frost-free season is approximately 105 to 130 days.

This map unit is approximately 80 percent Bowbac fine sandy loam. Within this map unit the following additional components are found: Cushman, Forkwood, Hiland, Terro, and Vonalee. Inclusions comprise approximately 20 percent of the map unit.

Permeability within the Bowbac fine sandy loam soil is moderate. The available water capacity is moderate. Effective rooting depth is 20 to 40 inches. Surface runoff is slow and the hazard of water erosion is slight. The hazard of wind erosion is severe.

Productivity and Reclamation Potential

There are eight plant species that are common to this map unit. They are as follows: Needleandthread, Prairie sandreed, Indian ricegrass, Little bluestem, Western wheatgrass, Blue grama, and Threadleaf sedge. Silver sagebrush is the only shrub specie found within this unit.

In a favorable year (above average moisture) the production is approximately 1,600 lbs/acre. In a normal year that production is 1,300 lbs/acre. Also in an unfavorable (drought) year the production is approximately 750 lbs/acre.

There are three areas that are considered for reclamation: topsoil, roadfill, and reclamation material. This unit is a fair source for topsoil with depth to bedrock and the high clay content being the limiting factors. It is a poor source for roadfill due to the low strength, depth to bedrock, and the shrink-swell capacity. As for reclamation material it is a fair choice for the following reasons: low organic matter content, high clay content, droughtiness, and depth to bedrock.

[1]Map unit description based on 2002 South Campbell County NRCS information.

158-1: Hiland fine sandy loam, 6 to 15 percent slopes[1]

The Hiland fine sandy loam map consists of very deep, well-drained soils that developed from alluvium and eolian deposits derived from sandstone and shale. It occurs on hills, ridges, backslopes, and footslopes at elevations between 4,100 and 5,300 feet.

The average annual precipitation ranges from 10 to 14 inches. The average annual air temperature is approximately 43 to 51 degrees F., and the average frost-free season is approximately 105 to 130 days.

This map unit is approximately 80 percent Hiland fine sandy loam. Within this map unit the following additional components are found: Bowbac, Decolney, Maysdorf, Terro, Vonalee, and Worf. Inclusions comprise approximately 20 percent of the map unit.

Permeability within the Hiland fine sandy loam soil is moderate. The available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is slow and the hazard of water erosion is slight. The hazard of wind erosion is severe.

Productivity and Reclamation Potential

There are eight plant species that are common to this map unit. They are as follows: Needleandthread, Prairie sandreed, Indian ricegrass, Little bluestem, Western wheatgrass, Blue grama, and Threadleaf sedge. Silver sagebrush is the only shrub specie found within this unit.

In a favorable year (above average moisture) the production is approximately 1,600 lbs/acre. In a normal year that production is 1,300 lbs/acre. Also in an unfavorable (drought) year the production is approximately 750 lbs/acre.

There are three areas that are considered for reclamation: topsoil, roadfill, and reclamation material. This unit is a fair source for topsoil with slope and the high clay content being the limiting factors. It is a good source for roadfill as no limitations are found. As for reclamation material it is a fair choice for the following reasons: high clay content, and low organic matter content.

[1]Map unit description based on 2002 South Campbell County NRCS information.

158-2: Bowbac fine sandy loam, 6 to 15 percent slopes[1]

The Bowbac fine sandy loam map unit consists of moderately deep, well-drained soils that developed from alluvium and eolian deposits over residuum weathered from calcareous sandstone. It occurs on hills, ridges, summits, and shoulders at elevations between 4,100 and 5,300 feet.

The average annual precipitation ranges from 10 to 14 inches. The average annual air temperature is approximately 43 to 51 degrees F., and the average frost-free season is approximately 105 to 130 days.

This map unit is approximately 80 percent Bowbac fine sandy loam. Within this map unit the following additional components are found: Decolney, Hiland, Maysdorf, Terro, Vonalee, and Worf. Inclusions comprise approximately 20 percent of the map unit.

Permeability within the Bowbac fine sandy loam soil is moderate. The available water capacity is moderate. Effective rooting depth is 20 to 40 inches. Surface runoff is slow and the hazard of water erosion is slight. The hazard of wind erosion is severe.

Productivity and Reclamation Potential

There are eight plant species that are common to this map unit. They are as follows: Needleandthread, Prairie sandreed, Indian ricegrass, Little bluestem, Western wheatgrass, Blue grama, and Threadleaf sedge. Silver sagebrush is the only shrub specie found within this unit.

In a favorable year (above average moisture) the production is approximately 1,600 lbs/acre. In a normal year that production is 1,300 lbs/acre. Also in an unfavorable (drought) year the production is approximately 750 lbs/acre.

There are three areas that are considered for reclamation: topsoil, roadfill, and reclamation material. This unit is a fair source for topsoil with slope, the high clay content, and depth to bedrock being the limiting factors. It is a poor source for roadfill due to the low strength, depth to bedrock, and the shrink-swell capacity. As for reclamation material it is a poor choice for the following reasons: high clay content, low organic matter content, depth to bedrock, and droughtiness.

[1]Map unit description based on 2002 South Campbell County NRCS information.

170-2: Tullock loamy sand, 6 to 30 percent slopes[1]

The Tullock loamy sands map unit consists of moderately deep, excessively-drained soils that developed from alluvium and eolian deposits over residuum weathered from calcareous sandstone. It occurs on hills, ridges, summits, and shoulders at elevations between 4,100 and 5,200 feet.

The average annual precipitation ranges from 10 to 14 inches. The average annual air temperature is approximately 47 to 53 degrees F., and the average frost-free season is approximately 105 to 130 days.

This map unit is approximately 80 percent Tullock loamy sands. Within this map unit the following additional components are found: Badlands, Blowouts, Keeline, Orpha, Taluce, Terro, and Vonalee. Inclusions comprise approximately 20 percent of the map unit.

Permeability within the Tullock loamy sands soil is rapid. The available water capacity is very low. Effective rooting depth is 20 to 40 inches. Surface runoff is very low and the hazard of water erosion is slight. The hazard of wind erosion is severe.

Productivity and Reclamation Potential

There are six plant species that are common to this map unit. They are as follows: Needleandthread, Prairie sandreed, Sand bluestem, Indian ricegrass, and Threadleaf sedge. Silver sagebrush is the only shrub specie found within this unit.

In a favorable year (above average moisture) the production is approximately 1,700 lbs/acre. In a normal year that production is 1,400 lbs/acre. Also in an unfavorable (drought) year the production is approximately 900 lbs/acre.

There are three areas that are considered for reclamation: topsoil, roadfill, and reclamation material. This unit is a poor source for topsoil with the high sand content, slope, and depth to bedrock being the limiting factors. It is a poor source for roadfill with depth to bedrock being the limiting factor. As for reclamation material it is a poor choice for the following reasons: high sand content, the wind erosion potential, low organic matter content, droughtiness, and depth to bedrock.

[1]Map unit description based on 2002 South Campbell County NRCS information.

171-1: Keeline, dry complex, 3 to 30 percent slopes[1]

The Keeline dry complex map unit consists of very deep, somewhat excessively drained soils that developed from alluvium and eolian deposits derived from calcareous sandstone. It occurs on hills, ridges, backslopes and footslopes at elevations between 4,100 and 5,200 feet.

The average annual precipitation ranges from 10 to 14 inches. The average annual air temperature is approximately 44 to 49 degrees F., and the average frost-free season is approximately 105 to 130 days.

This map unit is approximately 80 percent Keeline, dry complex. Within this map unit the following additional components are found: Badland, Blowout, Niobrara, Orpha, Tullock, and Turnercrest. Inclusions comprise approximately 20 percent of the map unit.

Permeability within the Keeline, dry complex soil is moderately rapid. The available water capacity is moderate. Effective rooting depth is 60 inches or more. Surface runoff is slow and the hazard of water erosion is moderate. The hazard of wind erosion is severe.

Productivity and Reclamation Potential

There are eight plant species that are common to this map unit. They are as follows: Needleandthread, Prairie sandreed, Indian ricegrass, Little bluestem, Western wheatgrass, Blue grama, and Threadleaf sedge. Silver sagebrush is the only shrub specie found within this unit.

In a favorable year (above average moisture) the production is approximately 1,600 lbs/acre. In a normal year that production is 1,300 lbs/acre. Also in an unfavorable (drought) year the production is approximately 750 lbs/acre.

There are three areas that are considered for reclamation; topsoil, roadfill, and reclamation material. This unit is a fair source for topsoil with slope being the limiting factor. It is a good source for roadfill as no limitations are found. As for reclamation material it is a fair choice for the following reason, low organic matter content.

[1]Map unit description based on 2002 South Campbell County NRCS information.

194-1: Pugsley sandy loams, 6 to 15 percent slopes[1]

The Pugsley sandy loams map unit consists of moderately deep, well-drained souls that developed from alluvium over residuum weathered from calcareous sandstone. It occurs on hills, ridges, summits, and shoulders at elevations between 4,100 and 5,000 feet.

The average annual precipitation ranges from 10 to 14 inches. The average annual air temperature is approximately 46 degrees F., and the average frost-free season is approximately 105 to 130 days.

This map unit is approximately 80 percent Pugsley sandy loams. Within this map unit the following additional components are found: Bowbac, Decolney, Hiland, and Worf. Inclusions comprise approximately 20 percent of the map unit.

Permeability within the Pugsley sandy loams soil is moderate. The available water capacity is very low. Effective rooting depth is 20 to 40 inches. Surface runoff is moderate, and the hazard of water erosion is severe. The hazard of wind erosion is severe.

Productivity and Reclamation Potential

There are eight plant species that are common to this map unit. They are as follows: Needleandthread, Prairie sandreed, Indian ricegrass, Little bluestem, Western wheatgrass, Blue grama, and Threadleaf sedge. Silver sagebrush is the only shrub specie found within this unit.

In a favorable year (above average moisture) the production is approximately 1,600 lbs/acre. In a normal year that production is 1,300 lbs/acre. Also in an unfavorable (drought) year the production is approximately 750 lbs/acre.

There are three areas that are considered for reclamation: topsoil, roadfill, and reclamation material. This unit is a fair source for topsoil with depth to bedrock and slope being the limiting factors. It is a poor source for roadfill due to the depth to bedrock. As for reclamation material it is a fair choice for the following reasons: droughtiness, depth to bedrock, and low organic matter content.

[1]Map unit description based on 2002 South Campbell County NRCS information.

194-2: Decolney sandy loams, 6 to 15 percent slopes[1]

The Decolney sandy loams map unit consists of very deep, well-drained soils that developed from alluvium and eolian deposits derived from sandstone and shale. It occurs on hills, ridges, backslopes, and footslopes at elevations between 4,100 and 5,000 feet.

The average annual precipitation ranges from 10 to 14 inches. The average annual air temperature is approximately 44 to 49 degrees F., and the average frost-free season is approximately 105 to 130 days.

This map unit is approximately 80 percent Decolney sandy loams. Within this map unit the following additional components are found: Bowbac, Hiland, Pugsley, and Worf. Inclusions comprise approximately 20 percent of the map unit.

Permeability within the Decolney sandy loams soil is moderate. The available water capacity is high. Effective rooting depth is 60 inches or more. Surface runoff is moderate and the hazard of water erosion is severe. The hazard of wind erosion is severe.

Productivity and Reclamation Potential

There are eight plant species that are common to this map unit. They are as follows: Needleandthread, Prairie sandreed, Indian ricegrass, Little bluestem, Western wheatgrass, Blue grama, and Threadleaf sedge. Silver sagebrush is the only shrub specie found within this unit.

In a favorable year (above average moisture) the production is approximately 1,600 lbs/acre. In a normal year that production is 1,300 lbs/acre. Also in an unfavorable (drought) year the production is approximately 750 lbs/acre.

There are three areas that are considered for reclamation: topsoil, roadfill, and reclamation material. This unit is a fair source for topsoil with slope being the limiting factor. It is a good source for roadfill as no limitations are found. As for reclamation material it is a fair choice for the following reason, low organic matter content.

[1]Map unit description based on 2002 South Campbell County NRCS information.

205-1: Samday clay loam, 3 to 15 percent slopes[1]
(Former Samsil series)

The Samday clay loam map unit consists of shallow, well-drained soils that developed from residuum weathered from calcareous shale. It occurs on hills, ridges, summits, and shoulders at elevations between 4,100 and 5,000 feet.

The average annual precipitation ranges from 10 to 14 inches. The average annual air temperature is approximately 44 to 49 degrees F., and the average frost-free season is approximately 105 to 130 days.

This map unit is approximately 80 percent Samday clay loam. Within this map unit the following additional components are found: Heldt, Hilight, Savageton, Theedle, and Worfka. Inclusions comprise approximately 20 percent of the map unit.

Permeability within the Samday clay loam soil is slow. The available water capacity is very low. Effective rooting depth is 10 to 20 inches. Surface runoff is very high and the hazard of water erosion is severe. The hazard of wind erosion is moderate.

Productivity and Reclamation Potential

There are five plant species that are common to this map unit. They are as follows: Western wheatgrass, Blue grama, Green needlegrass, and Bluebunch wheatgrass. Big sagebrush is the only shrub specie found within this unit.

In a favorable year (above average moisture) the production is approximately 1,000 lbs/acre. In a normal year that production is 750 lbs/acre. Also in an unfavorable (drought) year the production is approximately 450 lbs/acre.

There are three areas that are considered for reclamation; topsoil, roadfill, and reclamation material. This unit is a poor source for topsoil with depth to bedrock, slope and the high clay content being the limiting factors. It is a poor source for roadfill due to the low strength, depth to bedrock, and the shrink-swell capacity. As for reclamation material it is a poor choice for the following reasons: droughtiness, depth to bedrock, low organic matter content, high clay content, and the water erosion potential.

[1]Map unit description based on 2002 South Campbell County NRCS information.

213-1: Terro sandy loam, 6 to 30 percent slopes[1]

The Terro sandy loam map unit consists of moderately deep, well-drained soils that developed from alluvium over residuum derived from calcareous sandstone. It occurs on hills, ridges, backslopes, and summits at elevations between 4,100 and 5,200 feet.

The average annual precipitation ranges from 10 to 14 inches. The average annual air temperature is approximately 47 to 51 degrees F., and the average frost-free season is approximately 105 to 130 days.

This map unit is approximately 80 percent Terro sandy loam. Within this map unit the following additional components are found: Keeline, Orpha, Taluce, Turnercrest, Vonalee, and Badlands. Inclusions comprise approximately 20 percent of the map unit.

Permeability within the Terro sandy loam soil is moderately rapid. The available water capacity is very low. Effective rooting depth is 20 to 40 inches. Surface runoff is slow and the hazard of water erosion is severe. The hazard of wind erosion is severe.

Productivity and Reclamation Potential

There are eight plant species that are common to this map unit. They are as follows: Needleandthread, Prairie sandreed, Indian ricegrass, Little bluestem, Western wheatgrass, Blue grama, and Threadleaf sedge. Silver sagebrush is the only shrub specie found within this unit.

In a favorable year (above average moisture) the production is approximately 1,600 lbs/acre. In a normal year the production is 1,300 lbs/acre. Also in an unfavorable (drought) year the production is approximately 750 lbs/acre.

There are three areas that are considered for reclamation: topsoil, roadfill, and reclamation material. This unit is a poor source for topsoil with slope and depth to bedrock being the limiting factors. It is a poor source for roadfill due to the depth to bedrock and slope. As for reclamation material it is a fair choice for the following reasons: droughtiness, depth to bedrock, and low organic matter content.

[1]Map unit description based on 2002 South Campbell County NRCS information.

216-2: Kishona loam, 3 to 30 percent slopes[1]

The Kishona loam map unit consists of very deep well-drained soils that developed from alluvium derived from sandstone and shale. It occurs on hills, ridges, fan remnants, backslopes, and footslopes at elevations between 4,100 and 5,200 feet.

The average annual precipitation ranges from 10 to 14 inches. The average annual air temperature is approximately 43 to 51 degrees F., and the average frost-free season is approximately 105 to 130 days.

This map unit is approximately 80 percent Kishona loam. Within this map unit the following additional components are found: Cambria, Hilight, Shingle, Taluce, Theedle, and Turnercrest. Inclusions comprise approximately 20 percent of the map unit.

Permeability within the Kishona loam soil is moderate. The available water capacity is moderate. Effective rooting depth is 60 inches or more. Surface runoff is moderate and the hazard of water erosion is severe. The hazard of wind erosion is moderate.

Productivity and Reclamation Potential

There are six plant species that are common to this map unit. They are as follows: Needleandthread, Western wheatgrass, Blue grama, Green needlegrass, and Cusick's bluegrass. Big sagebrush is the only shrub specie found within this unit.

In a favorable year (above average moisture) the production is approximately 1,500 lbs/acre. In a normal year that production is 1,200 lbs/acre. Also in an unfavorable (drought) year the production is approximately 700 lbs/acre.

There are three areas that are considered for reclamation: topsoil, roadfill, and reclamation material. This unit is a fair source for topsoil with slope being the limiting factor. It is a poor source for roadfill due to the low strength, depth to bedrock, slope and the shrink-swell capacity. As for reclamation material it is a fair choice for the following reasons: low organic matter content, and the water erosion potential.

[1]Map unit description based on 2002 South Campbell County NRCS information.

221-1: Turnercrest fine sandy loam, 6 to 30 percent slopes[1]

The Turnercrest fine sandy loam map unit consists of moderately deep, well-drained soil that developed from alluvium and eolian deposits over residuum weathered from calcareous sandstone. It occurs on hills, ridges, summits, and shoulders at elevations between 4,100 and 5,200 feet.

The average annual precipitation ranges from 10 to 14 inches. The average annual air temperature is approximately 45 to 53 degrees F., and the average frost-free season is approximately 105 to 130 days.

This map unit is approximately 80 percent Turnercrest fine sandy loam. Within this map unit the following additional components are found: Keeline, Orpha, Taluce, Terro, Tullock, and Vonalee. Inclusions comprise approximately 20 percent of the map unit.

Permeability within the Turnercrest fine sandy loam soil is moderately rapid. The available water capacity is very low. Effective rooting depth is 20 to 40 inches. Surface runoff is moderate and the hazard of water erosion is severe. The hazard of wind erosion is severe.

Productivity and Reclamation Potential

There are six plant species that are common to this map unit. They are as follows: Needleandthread, Prairie sandreed, Western wheatgrass, Little bluestem, and Threadleaf sedge. Silver sagebrush is the only shrub specie found within this unit.

In a favorable year (above average moisture) the production is approximately 1,600 lbs/acre. In a normal year that production is 1,300 lbs/acre. Also in an unfavorable (drought) year the production is approximately 750 lbs/acre.

There are three areas that are considered for reclamation: topsoil, roadfill, and reclamation material. This unit is a poor source for topsoil with slope and depth to bedrock being the limiting factors. It is a poor source for roadfill due to the depth to bedrock. As for reclamation material it is a fair choice for the following reasons: low organic matter content, droughtiness, and depth to bedrock.

[1]Map unit description based on 2002 South Campbell County NRCS information.

221-3: Taluce fine sandy loam, 6 to 30 percent slopes[1]

The Taluce fine sandy loam map unit consists of shallow, well-drained soils that developed from residuum weathered from calcareous sandstone. It occurs on hills, ridges, summits and shoulders at elevations between 4,100 and 5,200 feet.

The average annual precipitation ranges from 10 to 14 inches. The average annual air temperature is approximately 42 to 51 degrees F., and the average frost-free season is approximately 105 to 130 days.

This map unit is approximately 80 percent Taluce fine sandy loam. Within this map unit the following additional components are found: Keeline, Orpha, Terro, Tullock, Turnercrest, and Vonalee. Inclusions comprise approximately 20 percent of the map unit.

Permeability within the Taluce fine sandy loam soil is rapid. The available water capacity is very low. Effective rooting depth is 10 to 20 inches. Surface runoff is very rapid and the hazard of water erosion is severe. The hazard of wind erosion is severe.

Productivity and Reclamation Potential

There are six plant species that are common to this map unit. They are as follows: Needleandthread, Prairie sandreed, Bluebunch wheatgrass, Little bluestem, Blue grama, and Threadleaf sedge.

In a favorable year (above average moisture) the production is approximately 1,300 lbs/acre. In a normal year that production is 1,000 lbs/acre. Also in an unfavorable (drought) year the production is approximately 600 lbs/acre.

There are three areas that are considered for reclamation: topsoil, roadfill, and reclamation material. This unit is a poor source for topsoil with slope and depth to bedrock being the limiting factors. It is a poor source for roadfill due to the depth to bedrock, and slope. As for reclamation material it is a poor choice for the following reasons: low organic matter content, droughtiness, and depth to bedrock.

[1]Map unit description based on 2002 South Campbell County NRCS information.

228-2: Renohill clay loam 0 to 6 percent slopes[1]

The Renohill clay loam map unit consists of moderately deep, well-drained soils that developed from alluvium over residuum weathered from calcareous shale. It occurs on summits and shoulders at elevations between 4,100 and 5,200 feet.

The average annual precipitation ranges from 10 to 14 inches. The average annual air temperature is approximately 43 to 47 degrees F., and the average frost-free season is approximately 105 to 130 days.

This map unit is approximately 80 percent Renohill clay loam. Within this map unit the following additional components are found: Bidman, Parmleed, Savageton, and Ulm. Inclusions comprise approximately 20 percent of the map unit.

Permeability within the Renohill clay loam soil is moderately slow. The available water capacity is moderate. Effective rooting depth is 20 to 40 inches. Surface runoff is moderate and the hazard of water erosion is moderate. The hazard of wind erosion is moderate.

Productivity and Reclamation Potential

There are four plant species that are common to this map unit. They are as follows: Green needlegrass, Western wheatgrass, Blue grama, and Cusick's bluegrass. Big sagebrush is the only shrub specie found within this unit.

In a favorable year (above average moisture) the production is approximately 1,400 lbs/acre. In a normal year that production is 1,000 lbs/acre. Also in an unfavorable (drought) year the production is approximately 600 lbs/acre.

There are three areas that are considered for reclamation: topsoil, roadfill, and reclamation material. This unit is a poor source for topsoil with the high clay content, and depth to bedrock being the limiting factors. It is a poor source for roadfill due to the low strength, shrink swell, and depth to bedrock. As for reclamation material it is a poor choice for the following reasons: high clay content, low organic matter content, depth to bedrock, and water erosion.

[1]Map unit description based on 2002 South Campbell County NRCS information.

236-2: Terro fine sandy loam, 2 to 10 percent slopes[1]

The Terro sandy loam map unit consists of moderately deep, well-drained soils that developed from alluvium over residuum derived from calcareous sandstone. It occurs on hills, ridges, shoulders, and summits at elevations between 4,100 and 5,000 feet.

The average annual precipitation ranges from 10 to 14 inches. The average annual air temperature is approximately 47 to 51 degrees F., and the average frost-free season is approximately 105 to 130 days.

This map unit is approximately 80 percent Terro sandy loam. Within this map unit the following additional components are found: Bowbac, Orpha, Taluce, Tullock, Vonalee, and areas with 10 to 15 percent slopes. Inclusions comprise approximately 20 percent of the map unit.

Permeability within the Terro sandy loam soil is moderately rapid. The available water capacity is low. Effective rooting depth is 20 to 40 inches. Surface runoff is slow and the hazard of water erosion is moderate. The hazard of wind erosion is severe.

Productivity and Reclamation Potential

There are seven plant species that are common to this map unit. They are as follows: Needleandthread, Prairie sandreed, Indian ricegrass, Little bluestem, Western wheatgrass, and Threadleaf sedge. Silver sagebrush is the only shrub specie found within this unit.

In a favorable year (above average moisture) the production is approximately 1,600 lbs/acre. In a normal year that production is 1,300 lbs/acre. Also in an unfavorable (drought) year the production is approximately 750 lbs/acre.

There are three areas that are considered for reclamation: topsoil, roadfill, and reclamation material. This unit is a fair source for topsoil with depth to bedrock being the limiting factor. It is a poor source for roadfill due to the depth to bedrock. As for reclamation material it is a fair choice for the following reasons: low organic matter content, droughtiness, and depth to bedrock.

[1]Map unit description based on 2002 South Campbell County NRCS information.

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